Elements of Administration

CPCCBC5003A, CPCCBC5010B,
CPCCBC5002A, CPCCBC4013A

Learner’s Guide
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Introduction

This resource provides an overview of what can be called the administrative aspects of building contracting.

It addresses the fundamental factor of building quantities and goes on to consider the associated activities of estimating and tendering. Also addressed are aspects of building contracts and contract administration, including variations and interim certificates.

This revised text provides information particularly pertinent to a range of common managerial functions in that section of the industry engaged in commercial/industrial projects. As such, it is especially suitable for use in a number of units in the Diploma of Building and Construction (Building) (Builder’s Registration) course and other courses of similar academic standard.

It is a required resource for the following Diploma of Building and Construction (Building) (Builder’s Registration) units:

- CPCCBC5003A (State code W9290) – Supervise the planning of on-site medium-rise building or construction work
- CPCCBC5010B (W9297) – Manage construction work.

It is also a recommended text for the following Diploma units:

- CPCCBC5002A (W9289) – Monitor costing systems on medium-rise building and construction projects
- CPCCBC4013A (W9250) – Prepare and evaluate tender documentation.

* This text is a revision of an original work, Building Quantities, Estimating and Administration, first published by Technical Publications Trust (a forerunner of WestOne Services) in 1991.
Chapter 1

Building procurement – traditional

Definition of terms

The following list defines some of the terms associated with quantity surveying.

Architect: The proprietor’s or owner’s representative, who is employed by the owner to design and supervise construction of the owner’s project. The architect is not a party to the contract and should be unbiased towards owner or contractor.

Proprietor: The project owner. The proprietor signs the building contract with the builder.

Builder: The person or company trading as a builder that signs the building contract with the proprietor.

Contractor: The successful builder after the signing of the contract document.

Tenderer(s): The builder or builders pricing tender documents with the view to submitting a tender for the project.

Subcontractor: A person or company specialising in one of the building trades that contracts with the builder to supply labour and/or materials for a part of the contract.

Nominated subcontractor: A subcontractor nominated by the client (or proprietor) or architect to perform work of a specialised nature. This work is normally covered by a provisional sum in the contract documents and may cover an area such as electrical services, mechanical services or lifts etc.

Provisional sum: A sum of money stated in the contract documents to cover work of a specialist nature to be performed by a subcontractor selected by the architect/client.

When pricing the project, the builder is required to add their profit and estimated cost of attendance to the provisional sum.

Attendance: An allowance made by the builder on a provisional sum to cover the cost of facilities they must provide to the nominated subcontractor.

Provisional item: An item included in the bill of quantities to provide a basis for future adjustment. It is used where the exact extent and nature of the work involved is not known at the time tender documents are being prepared.
Provisional quantity: Similar to a provisional item, but usually the nature of work involved is known at the time of documentation preparation; however, the extent of work is uncertain (e.g. piling and keeling to drains).

Prime cost sum: A sum of money stated in the specification and bill of quantities to be included in the tender amount to cover the cost of goods to be supplied or selected by the client or architect. The tenderers must add to this amount their price for fixing, profit, overheads etc.

Contingency sum: A sum of money stated in the specification and bill of quantities to be included in the tender amount for unforeseen circumstances. Any part unspent at the completion of the contract is to be deducted from the contract sum. The architect’s authority is required for any of the money to be spent.

Contract: An agreement, enforceable at law, whereby one party undertakes to provide some service or perform some action, in return for some consideration provided by the other party, within a set period of time. It is generally preferable for the contract to be in writing.

Contract documents

These documents consist of the following.

- **Conditions of contract** – These usually take the form of a formal document and are drawn up to protect the rights and stipulate the responsibilities of the parties to the contract; these conditions form the basis of the legal agreement.

- **Specification** – The specification describes in detail the types of materials to be used, the standard of workmanship required and further necessary information which is not shown or indicated on the drawings.

- **Drawings** – The drawings detail the layout of the building, together with dimensions and sizes, and at the same time indicate how the various elevations appear.

- **Bill of quantities** (major works only) – formal bill as defined in Chapter 3.

Structure and processes

In meeting the needs of clients, the building industry has evolved an operational structure comprising three major processes:

- design
- tender
- construction.

This structure is basic to all building, but the personnel and techniques required for each process become more specialised as the size and complexity of the building project increase.
Building projects can be loosely classified by their size and complexity into the following three categories:

- small alteration works
- domestic, light industrial and low-rise commercial works
- major government capital works (such as schools and hospitals) and multistorey developments.

These will be looked at in the following pages.

Over the years a procedure has evolved for the procurement of building projects of all classifications.

Figure 1.1 shows this procedure, which is the traditional approach to building procurement.

---

**Fig 1.1 Traditional building procurement procedure**
Small alteration works

The straightforward building needs of a client, for example verandahs, pergolas and boundary walls, are often completely met by a tradesperson who carries out all the building processes himself or herself. The design and tendering stages may not be formalised beyond sketches, and estimates are little more than assessments of the material and labour required, based on past experience.

In these situations, quantities of materials to be ordered are assessed according to the principles outlined in the WestOne Services publication *Builders’ Quantities for Ordering or Estimating*.

The size and complexity of work capable of being handled by one person is necessarily limited and, as jobs increase in complexity, the three building processes of design, tender and construction each require specialist attention.

Domestic, light industrial and low-rise commercial works

Design process

The size and complexity of such work demands a formal division between design and construction. The client’s design needs are met by a consultant (usually an architect) who is retained by the client for a fee (see Figure 1.2). The architect interprets the client’s building needs by means of drawings and specifications. In buildings of this category, the architect is often the sole consultant and can usually address both structural and architectural issues as well as giving the client budget advice and approximate estimates.

This type of work is commonly known as ‘spec and drawings’ work, as the specification, drawings and conditions of contract form the basis of the tender and later legal agreement. The design process is, initially, completely divorced from the construction process but, on completion, the drawings and specifications are made available for builders to use as a basis for their tender.

Tender process

Builders interested in tendering for the job must measure the quantities and submit a tender based upon the labour, materials, plant and overheads needed to meet the requirements of the drawings and specification. Time available to tender is usually about three weeks and the works are usually open to all – that is, bids are sought from several builders. Builders therefore may be submitting several bids for different jobs concurrently.
Fig 1.2 Organisational relationship – architect-alone method
Measuring quantities of material to the detail required for ordering described in the WestOne resource *Builders’ Quantities for Ordering or Estimating* is time-consuming and inappropriate. Instead, builders’ tendering needs are met by estimators or builders’ quantity surveyors. They are usually employed by the builder on a salary basis, though sometimes on contract. Quantities taken are schedules to allow both the labour and material content to be priced against an item or unit of measurement. *Bulk quantities* is the term used in this text to define such quantities, which are dealt with in detail in Chapter 7.

**Construction process**

A form of contract is used between client and builder to determine the rights and responsibilities of the client and contractors during the construction process.

The architect is designated to look after the interests of the client. The builder’s estimator/quantity surveyor carries out those duties necessary to ensure a continuous cash flow and submits to the client, through the architect, periodic valuations of work done for progress payments and claims against variation orders issued by the architect. In turn, the accounts and claims of the builder’s own trade subcontractors are settled. At the completion of the work, a final account incorporating all claims is agreed with the architect. (This will be covered in detail in later chapters.)

**Major works**

As the size and complexity of projects increase, further specialisation of all processes occurs.

**Design process**

Here the architect gets help from other consultants. Structural design and the major building services of electrical, air-conditioning and lift installation need the expertise of specialist engineers. However, the architect remains a principal consultant and is responsible for coordinating all the specialist input into the tender documents.

Budget advice and progressive estimates to monitor design to ensure that budget figures are maintained also require expert input. The consultant retained for this work is an independent professional quantity surveyor. To aid the tendering, the professional quantity surveyor measures and schedules the work from the architect’s specifications and drawings in accordance with standard principles. These quantities are known as *formal quantities* and are considered in Chapter 8. The document produced (called a *bill of quantities*) is made available with the drawings and specification for builders to use as a basis for their tender.

**Tender process**

The tender documentation comprises:

- form of contract
- specification
- drawings
- bill of quantities.
As a bill of quantities is available, each builder is saved both the time involved in preparing this and the risk of making errors in measuring individual quantities.

The tender bill of quantities is measured according to a standard set of principles called the *Australian Standard Method of Measurement of Building Works* (SMM). Descriptions of the content of works units to be priced are also standardised.

The specialist building services, particularly electrical and air-conditioning installation, are often documented and tendered separately. Monetary allowance for this work is already included in the specification and bill of quantities when collected by the builder. Initially all the builder need do is add allowances to the specialised work prices for themself, for materials, profit and attendance.

Tenders are called later from firms working in the specialist area and the builder is then directed to enter into a subcontract with the specialist firm selected. This arrangement is called a *nominated subcontract*. Monetary sums and nominated subcontracts are discussed more fully in later chapters.

**Construction process**

Consultants are retained during the construction process to administer, and report to the architect, the post-contract progress in their specialist areas.

The architect maintains a position as principal consultant but delegates many of the procedures for financial administration to the consultant quantity surveyor.

The builder’s quantity surveyor has the added responsibility of the nominated subcontractors’ accounts and claims, as well as those of the builder and the builder’s own subcontractors.

The consultant quantity surveyor and builder’s quantity surveyor liaise to produce a final account for the work.

**Building procurement – other developments**

The processes described above relate to the traditional situation of clients financing their own unique building needs. Other processes have developed where:

- the builder initiates, or provides financing and design of, the project;
- the tendering and construction processes are organised by a project manager rather than the traditional building company. (This will be covered in later chapters.)

Consultant design and administration skills remain basically the same but procedures and techniques are adopted to suit the changed circumstances. A common form of builder initiation is ‘project homes’ (see Figure 1.3). In this industry, measuring skills are concentrated on scheduling materials and organising subcontractors to ensure the continued profitability of a design concept.
Fig 1.3 Organisational relationship – design and construction method

(Example: project homes)
Chapter 2

Quantity surveying

Defining quantity surveying

In Chapter 1 reference was made to the need to measure quantities for the three classifications of building works in order to determine the following:

- builders’ quantities for ordering for small works
- bulk quantities for tendering on specification and drawings
- ‘formal’ quantities prepared by an independent consultant quantity surveyor to aid tendering on major works.

Quantity surveying is the generic term associated with measuring to ascertain the cost of building. The measuring processes are principally associated with the design and tender stages of a particular project but information gathered during these processes is also useful for determining general building-cost yardsticks and assisting in the financial management of the construction stage.

Quantity surveyors usually act as independent consultants engaged by a client, but they may be employed on a salary basis by a builder.

The duties of a quantity surveyor are wide and varied; however, they may be placed into two broad categories:

- pre-contract
- post-contract.

While similarities exist, the duties of a builder’s quantity surveyor and a consultant quantity surveyor differ. These duties will be looked at in the next few pages.

The builder’s quantity surveyor/contracts administrator

The employment of a quantity surveyor generally depends upon the size of the firm and the tasks it performs. The quantity surveyor can be called on by the builder to do all or any of the following tasks:

pre-contract

- prepare a schedule of quantities if no bill has been provided
- price the schedule or bill
- call for subcontract quotations and select those most likely to be used in the tender
- submit tenders on various projects
post-contract

- accept subcontract quotations
- prepare material schedules and order materials as and when they are required
- liaise with and coordinate subcontractors
- prepare progress claims, including checking and collating subcontractors’ claims
- check and compare actual costs with estimated costs
- prepare final accounts, including checking and inclusion of subcontractors’ accounts
- prepare rise-and-fall claims if applicable.

This list will vary depending on the size of the building firm and its policies. These tasks are summarised in Figure 2.1.

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<td>Prepares tender estimate.</td>
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<td>Conducts negotiation with:</td>
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<tr>
<td>- client</td>
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<tr>
<td>- subcontractors.</td>
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<table>
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<tr>
<th>Post-contract</th>
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<td>Participates in contract administration of:</td>
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<td>- subcontractors</td>
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<tr>
<td>- variations</td>
</tr>
<tr>
<td>- progress payments</td>
</tr>
<tr>
<td>- final accounts.</td>
</tr>
</tbody>
</table>

Fig 2.1 The role of the builder’s quantity surveyor

The consultant quantity surveyor

The consultant quantity surveyor performs a wide range of functions on behalf of the client, the principal ones being the following:

pre-contract

- prepare preliminary estimates and feasibility from architect’s sketch drawings for developers
- assist with and advise on cost planning and budgeting as projects develop from sketches into working drawings and tender documents
- prepare bills of quantities – these being tender documents
- check tenders before acceptance of successful tenderer
post-contract
- assist with and advise on costs and budgeting as the work proceeds
- check progress claims prior to certification by architect
- check variation claims prior to formal acceptance for payment by architect
- settle minor disputes between architect and builder and eliminate the need for arbitration
- act as an arbitrator in major disputes
- give advice or evidence in cases involving arbitration or court procedure
- check final accounts prior to acceptance and certification by the architect
- analyse tenders and final accounts into forms suitable for use in future estimates and feasibility studies.

(The quantity surveyor can also be involved in the writing of specifications in the pre-contract stage, though this generally is a responsibility of the architect.)

Figure 2.2 illustrates the relationship of the consultant quantity surveyor to the architect. Figure 2.3 compares the functions of a consultant quantity surveyor with those of a builder’s quantity surveyor.

<table>
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<tr>
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<th>Architect/designer functions</th>
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<tr>
<td>Feasibility study</td>
<td>Prepare brief</td>
</tr>
<tr>
<td>Establish budget</td>
<td>Outline proposal</td>
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<tr>
<td>Cost planning:</td>
<td>Sketch design</td>
</tr>
<tr>
<td>• cost studies</td>
<td>Tender documents</td>
</tr>
<tr>
<td>• bulk quantities</td>
<td>Check documents</td>
</tr>
<tr>
<td>• detailed estimate</td>
<td>Tender report</td>
</tr>
<tr>
<td>• bill of quantities</td>
<td></td>
</tr>
<tr>
<td>Check tender estimate</td>
<td></td>
</tr>
<tr>
<td>Tender report</td>
<td></td>
</tr>
<tr>
<td><strong>Post-contract</strong></td>
<td>Supervise project</td>
</tr>
<tr>
<td>Cost control:</td>
<td>Issue site instructions</td>
</tr>
<tr>
<td>• variations</td>
<td>Issue variation orders</td>
</tr>
<tr>
<td>• progress payments</td>
<td></td>
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<tr>
<td>• final accounts</td>
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</table>

Fig 2.2 Chart indicating the relationship of the architect and consultant quantity surveyor

It is important to note that the quantity surveyor’s role originally evolved to produce bills of quantities.
<table>
<thead>
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<th>Functions of consultant quantity surveyor</th>
<th>Functions of builder’s quantity surveyor</th>
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<td><strong>Pre-contract</strong></td>
<td></td>
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<td>Client</td>
<td></td>
<td></td>
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<tr>
<td>Perceived need</td>
<td></td>
<td></td>
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<tr>
<td>Feasibility study</td>
<td>cost studies</td>
<td>prepare estimate</td>
</tr>
<tr>
<td>Budget</td>
<td>establish budget</td>
<td>submit tender</td>
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<tr>
<td></td>
<td>(historical costs)</td>
<td></td>
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<tr>
<td>Sketch design</td>
<td>cost studies</td>
<td>confirm quotation with:</td>
</tr>
<tr>
<td>Design documentation</td>
<td>cost planning</td>
<td>• suppliers</td>
</tr>
<tr>
<td>Tender period</td>
<td>tender estimate</td>
<td>• subcontractors</td>
</tr>
<tr>
<td>Tender review</td>
<td>evaluate tenders</td>
<td></td>
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<tr>
<td>Sign contract</td>
<td>negotiation with builder</td>
<td>negotiation with client</td>
</tr>
<tr>
<td><strong>Post-contract</strong></td>
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<tr>
<td>Construction</td>
<td>cost control, ie check:</td>
<td>sign S/C agreements</td>
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<tr>
<td></td>
<td>• variations</td>
<td>project control, ie submit:</td>
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<td></td>
<td>• progress payments</td>
<td>• variations</td>
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<td></td>
<td>• claims</td>
<td>• progress payments</td>
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<td></td>
<td>• final accounts</td>
<td>• claims</td>
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<tr>
<td>Occupation</td>
<td>cost analysis for future data</td>
<td>control subcontracts</td>
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<td></td>
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<td>compare budget to actuals</td>
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<td></td>
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<td>to establish profit and</td>
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<td>information for estimation data</td>
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*Fig 2.3 Chart indicating the functions of a consultant quantity surveyor and builder’s quantity surveyor*
Chapter 3

Types of quantities

Introduction

The measuring function of quantity surveying includes the preparation of lists, schedules or bills of quantities for materials required by a builder for the construction of a proposed building. These lists or bills include descriptions of all items of work, together with the quantities applicable to each item.

It should be made clear that there are a range of approaches or methods by which these lists or bills of quantities may be prepared. The particular method used by the quantity surveyor will depend entirely on the required form of the end product or bill and the use to which this document will be put. For example, the list of quantities of materials to be purchased, say, to build a brick fence will vary considerably from the description and quantity referring to this fence in a formal bill of quantities prepared by a professional quantity surveyor – yet both may be referred to as the quantities for this item.

There are three main approaches to quantity surveying and these, for convenience, may still be called:

- builders’ ordering quantities
- builders’ bulk quantities
- formal quantities.

These will be dealt with in the following pages.

Note that the differences between the three main approaches are illustrated in Figures 3.2–3.4. These show three different bills for concrete footings for the same building (see Figure 3.1). Each bill was produced by a different one of the three main approaches to quantity surveying.
Chapter 3  

Types of quantities

Builders’ ordering quantities

These may be defined as those quantities, taken in the builder’s office, for the purpose of:

- establishing the actual quantity to be priced when estimating and
- ordering materials for delivery to the site for construction.

Generally, these quantities will refer to materials only and will be taken in units that will facilitate ordering and pricing – that is, in units in accordance with current and local trade practice and merchants’ units of packaging, sales and invoicing.

Builders’ ordering quantities must be clearly understood by all staff and tradespeople within a particular building company. Many companies establish a format and sheet rulings of their own, to suit the particular requirements of that company.

Figure 3.2 gives an example of a bill of quantities produced using builders’ ordering quantities. The bill is for concrete footings and based on the building drawing in Figure 3.1.

Builders’ bulk quantities

It was noted earlier that the documentation for many medium-sized projects consists of specifications and drawings. Builders are required to prepare their own bill of bulk quantities. The aim is to provide a basis for a tender in as short a time as possible, but the approach may vary from builder to builder. Quantities in each trade are usually measured separately for convenience in obtaining quotes from subcontractors. Cost-significant work is described and measured by appropriate units (eg linear, square or cubic metres). The unit quantities are priced by the building estimator. Each work description is analysed and the unit rate includes the cost of labour, plant, overheads and the material and waste content of the item, as well as profits. Figure 3.3 illustrates a bill of quantities produced using builders’ bulk quantities. Again it refers to the concrete footings for Figure 3.1.

Quantities are measured to the extent and in the manner considered most expedient by the builder to aid their tendering.

Therefore, the particular cost-significant work identified in bulk quantities may vary from builder to builder and project to project. In larger works, the need for consistency to ensure a common base for tendering may lead to the use of formal quantities.

The practice of incorporating all the elements of cost into a unit rate enables records of rates to be compiled. Such rates, when multiplied by the quantities taken, allow for a quicker means of establishing estimates than compiling the components of cost separately.
Formal quantities

These may be defined as those quantities (taken by a consultant quantity surveyor essentially for the purpose of preparing a formal bill of quantities) for distribution to a number of builders wishing to prepare competitive tenders on a proposed large construction project. Generally these quantities require the builder to price materials, labour, plant, overheads and profit. The basis of the quantities must be clearly understood by all associated with the building industry and hence descriptions and measurement must be in accordance with the SMM. Figure 3.4 shows a bill of quantities for the concrete footings for Figure 3.1.

Note that the main purpose of a bill of quantities is to provide a common basis for competitive tendering. However, the following is a list of all the various uses of, or purposes for, a bill of quantities:

- to place all tenderers on an equal footing. If there is an error in any one item relating to the quantity measured, all the tenderers are affected equally by that error, so that tenders remain competitive.
- to facilitate the valuing and negotiating of variations
- to assist in the preparation of progress payments
- to form the basis for cost analysis and the budgeting of the client’s cash flow
- to assist in the planning of bar charts, time schedules and work organisation
- to assist in the preparation and settlement of the final account.

When comparing Figures 3.2–3.4, which illustrate the three different approaches to quantity surveying, namely builders’, bulk and formal, notice the following points:

- The builders’ quantities are in fact the quantities of materials that need to be ordered and purchased for the slab. This quantity differs from the formal and bulk quantities which would be regarded as quantities required for estimating labour and materials to the completed job.
- The description and billing of the formal quantities is further specifically determined by the requirements of the SMM. For example, the concrete is identified as plain concrete; reinforced concrete is measured separately.
Fig 3.1 Example drawing
### A. Provide 20 MPa concrete to footing (supply only)

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/ 13.67</td>
<td>27.34</td>
</tr>
<tr>
<td>2/  8.15</td>
<td>16.30</td>
</tr>
<tr>
<td>2/   0.96</td>
<td>1.92</td>
</tr>
<tr>
<td>Ext. Brk. Perim.</td>
<td>45.56</td>
</tr>
<tr>
<td>8/ 0.135</td>
<td>1.08</td>
</tr>
<tr>
<td>ddt. shift (S1)</td>
<td>44.48</td>
</tr>
<tr>
<td>M.G.</td>
<td></td>
</tr>
</tbody>
</table>

\[
44.48
\]

\[
0.375
\]

\[
0.20
\]

\[
0.17
\]

Add 5% waste

\[
3.51
\]

\[
\text{Order } 3.6
\]

### B. Labour to pour footing

<table>
<thead>
<tr>
<th>Quantity</th>
<th>m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.6</td>
<td></td>
</tr>
</tbody>
</table>

---

**Fig 3.2 Builders’ ordering quantities**

### A. 20 MPa concrete to strip footing

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>2/ 13.67</td>
<td>27.34</td>
</tr>
<tr>
<td>2/  8.15</td>
<td>16.30</td>
</tr>
<tr>
<td>2/   0.96</td>
<td>1.92</td>
</tr>
<tr>
<td>Ddt 8/ 0.135</td>
<td>1.08</td>
</tr>
<tr>
<td>Shift 44.48</td>
<td></td>
</tr>
</tbody>
</table>

\[
44.48
\]

\[
0.38
\]

\[
0.20
\]

\[
3.38
\]

**NOTE:** Waste is not added in bulk and formal quantities, as it is allowed by the estimator in the unit rate.

Quantities are rounded to the nearest one-tenth of a unit for bulk quantities and to the nearest whole unit for formal quantities.

**Fig 3.3 Builders’ bulk quantities**
Chapter 3
Types of quantities

### A. Plain concrete (20 MPa) poured into trenches for strip footings

<table>
<thead>
<tr>
<th></th>
<th></th>
<th>m³</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2/</td>
<td>13.67</td>
<td>27.34</td>
<td></td>
</tr>
<tr>
<td>2/</td>
<td>8.15</td>
<td>16.30</td>
<td></td>
</tr>
<tr>
<td>2/</td>
<td>0.96</td>
<td>1.92</td>
<td></td>
</tr>
<tr>
<td>Ddt</td>
<td>8/</td>
<td>0.135</td>
<td>1.08</td>
</tr>
<tr>
<td>Shift</td>
<td></td>
<td></td>
<td>44.48</td>
</tr>
<tr>
<td>44.48</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.38</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.20</td>
<td></td>
<td>3.38</td>
<td></td>
</tr>
</tbody>
</table>

### NOTE: Description must comply with SMM requirements.

**Example of unit rate used for estimating for bulk or formal quantities:**

Concrete (20 MPa) poured into trenches in strip footing –

- Material supply including delivery = 85.00
- Waste 5% = 4.25
- Labour placing 1.5 hrs per m³ at $18.00 per hr = 27.00
- Plant - proportion of hire charges = 2.00
- Overheads and profit 10% (85 + 4.25 + 27) = 11.65
- Unit rate per m³ = 129.90

**Fig 3.4 Formal quantities**

### Types of bills of quantities

Apart from the obvious differences from one project to another, there are different kinds and styles of bills. This does not mean that the SMM is disregarded.

**Trade bill of quantities**

This text will deal mainly with the production of the usual *trade bill of quantities*. This contains brief descriptions of work required and is issued to tenderers together with a separate specification produced by the architect.

**Specification and bill of quantities**

Frequently the bill and specification are bound together in one cover, sometimes on a trade-by-trade (specification/bill/specification/bill) basis and usually of different colours. This is known as a *specification and bill of quantities*. 
Specified bill of quantities

This is produced where no separate specification is being issued. Unlike the specification and bill, the specification is integrally part of the bill. Descriptions of work and the descriptions in preamble clauses in the bill are expanded, eliminating the need for two documents with their duplication of wording and possible discrepancies. In each case, the methods of arriving at and setting down quantities are the same; only the descriptive matter changes in the specified bill.

These styles were simply developed to aid cross-referencing between the specification and the bill of quantities.

Provisional bill of quantities

The provisional bill of quantities and the closely aligned schedule of rates are commonly used when either the full extent of the work to be done (eg alterations or extensions to existing premises or fire damage repair work) is not known at the time of calling tenders or where the client is anxious to commence, complete and occupy the project without allowing sufficient pre-tender time for the compilation of proper drawings and specifications before the bill of quantities is produced.

The schedule of rates contains only descriptions, to be priced at unit rates. The provisional bill contains descriptions of work and approximate quantities to be priced at unit rates, giving in this case an approximate project value which becomes the tender price or target price. In each case, the work is re-measured on site, or off working drawings, while the project is in progress and valued according to unit rates, with the true contract price assessed on completion of the work.

Other types

There are other types of bill which really are just variations of the above basic themes. The more common are:

- the correlated specification and bill, in which the specification is printed on one page with the corresponding quantified descriptions on the facing page
- the operational bill, in which the work is classified or grouped into sections in sequence of construction, instead of trade by trade, to aid progress payment evaluations
- the elemental bill, in which the work is classified or grouped into sections such as the structural frame, floors and their finishes, walls and their finishes or other such ‘elements’, as a particular system of cost analysis to aid the professional quantity surveyor in cost planning.
Summary

While builders’ bulk quantities and formal quantities are branches of the same tree, the aims and the methods adopted in achieving those aims differ, particularly in the area of measuring and billing quantities.

The aim of a builder or their estimator in taking off ordering quantities is to establish, prior to construction, the actual quantity which will be used during construction. This information is needed in order to:

- estimate the net cost of a project to the builder and so, subsequently, the gross cost to the project proprietor
- provide a basis for ordering the actual quantities of materials which will be required.

These measurements will thus be in units which agree with current and local trade practice for the purchase and transportation of builders’ materials and will include all necessary allowances for waste, packaging and so on. The method adopted will be whatever the builder/estimator decides upon at the time to suit their circumstances.

The aim of a builder in taking off bulk quantities is to aid estimating only – only the main items will be measured.

By contrast, the aim of the consultant quantity surveyor in performing formal quantities is to provide a group of tenderers on a single project with one set of data upon which to base their tenders. The production of quantities is standardised according to the restraints of the SMM. This standardisation is essential because the tenderers (and thus the selected builder) are unknown to the quantity surveyor, yet each tenderer must understand the implications of the bill as well as price-explicit items.

In practice, there is a further and deeper difference between a builder’s own quantity surveyor/estimator and a consultant quantity surveyor. A builder’s quantity surveyor/estimator’s prime responsibility is to their employer, the builder, who wishes to ensure maximum efficiency and profitability of the company. The independent consultant quantity surveyor has an intermediary role, between builder and project proprietor, to ensure that neither should unduly profit at the expense of the other. The consultant ensures that the proprietor gets fair value for money invested and the builder is fairly paid for what they have constructed.
Chapter 4

Types of preliminary estimate

Builders’ quantity surveyors sometimes have to establish rapid estimates on little information before committing themselves to detailed time-consuming estimates. Preliminary or approximate estimates are used to provide indications of costs at little expense. The method of arriving at the approximation depends upon the time and information available. The duties of consultant quantity surveyors include the preparation of some estimates.

Preliminary or approximate estimating relies upon the use of costs that have been recorded previously and which relate to a unit measurement. For example, the cost of a building can be related to its floor area by establishing a rate per square metre. The assumption is that similar buildings will have a comparable rate per square metre. An approximate estimate of a building can therefore be established simply by multiplying the floor area by the estimated rate per square metre and updating for cost increases (inflation).

Four common methods, all employing the same basic principle, are mentioned below. Examples may be found at the end of this chapter.

Functional units

When preparing a preliminary estimate, the building is considered in terms of the number of units for which it is primarily designed, for example a ten-classroom school, a hundred-bed hospital or a fifty-bed hospital.

A five-classroom school should be approximately half the cost of a ten-classroom school, provided that the ancillary features such as toilets, canteens and sports areas remain proportionately the same.

Once again, specialist services require individual consideration and adjustment.
Area of building (square)

The total building area in square metres is calculated taking in all structural floor slabs and multiplied by the cost per square metre of a previously erected similar structure. The measurements are taken to the outside of the walls.

Such items as lifts, air-conditioning and other costly works of a specialist nature should be excluded and a separate valuation made of the costs involved.

Basements, terraces and garages should be included at a different rate per square metre.

Elements

Greater accuracy will be achieved by more detailed measuring and, with this in mind, a system of measuring the elements of a building has been adopted. Examples of such elements are:

- suspended concrete floor, including formwork and an average quantity of reinforcement. This is measured in square metres and the number multiplied by an all-inclusive rate based on previous projects.
- composite 270-mm-thick hollow walls, faced externally and plastered and painted internally. Again, the total in square metres is multiplied by an all-inclusive unit rate.
- doors and windows including frames, ironmongery, glazing and painting. These are counted and the number then multiplied by the cost of an average door or window, including such accessories.

Bulk or approximate quantities

Individual quantities are measured but not to the degree of accuracy and detail required for tendering. Measurement is by trade rather than elements, to facilitate the use of unit rates and subcontractors’ prices. The accuracy is dependent upon the quality of information available. Generally the greater the detail, the more accurate the estimate. Estimates are often established quickly from little detail and progressively refined and confirmed as more detail becomes available.

Inflation

Previous records used as a basis for estimates must be updated to take into account increases in costs of labour and material since the records were compiled. A simple percentage adjustment based on building price indices can be made.
Accuracy of preliminary estimates

The accuracy of an estimate depends upon the time and information available. The accuracy of any type of preliminary estimate will be low compared to one where detailed information is provided and adequate preparation time allowed, as shown in the table below.

<table>
<thead>
<tr>
<th>Type of estimate</th>
<th>Accuracy of estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detailed quantities and pricing</td>
<td>HIGH – adequate time for preparation and detailed information provided.</td>
</tr>
<tr>
<td>Bulk or approximate quantities and pricing</td>
<td>LOW – little time for preparation and minimal information allows only a preliminary or approximate estimate.</td>
</tr>
<tr>
<td>Elements × rate</td>
<td>(Note: These types are not listed in any order of accuracy. They will be selected by practitioners based on convenience and suitability for a particular requirement.)</td>
</tr>
<tr>
<td>Area of building × rate</td>
<td></td>
</tr>
<tr>
<td>Functional units × rate</td>
<td></td>
</tr>
</tbody>
</table>
Examples of different types of preliminary estimate

Note: These examples are based on three different projects.

1. Function unit

<table>
<thead>
<tr>
<th>Proposed block 5 units</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical costs</td>
<td>Previous units built</td>
</tr>
<tr>
<td>Total cost</td>
<td>$300,000.00</td>
</tr>
<tr>
<td>No. of units</td>
<td>10</td>
</tr>
<tr>
<td>∴</td>
<td>$30,000/unit</td>
</tr>
<tr>
<td>Increase for</td>
<td>inflation to</td>
</tr>
<tr>
<td>current</td>
<td>5%</td>
</tr>
</tbody>
</table>

$31,500.00/unit

∴ Budget cost $157,500

External works, services $2,500
Add for cost escalation $2,000
Total budget $162,000

2. Area of building (square)

<table>
<thead>
<tr>
<th>Measuring from proposed sketches</th>
<th>1000 m²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Historical costs suggest</td>
<td>$600/m²</td>
</tr>
<tr>
<td>Budget</td>
<td>1000 m² × $600</td>
</tr>
</tbody>
</table>

= $600,000

External works 5,000
External services 2,000
Adjust for cost escalation to completion $20,000
Total budget $627,000 say $630,000
3. Elements

Cost of each element is derived from previous project unit rates and records are kept for use as required.

eg Upper floor slab

Area = 100 m²

200-thick concrete slab $20,000
Reinforcement $20,000
Formwork $10,000
Total cost of slab $50,000 ÷ 100 m²
∴ Upper floors $500/m²

Typical elemental cost

<table>
<thead>
<tr>
<th>Proposed building</th>
<th>Elemental area</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ground floor slab and footings</td>
<td>150 m²</td>
<td>$200</td>
<td>$300,000</td>
</tr>
<tr>
<td>Upper floor slab</td>
<td>300 m²</td>
<td>$500</td>
<td>150,000</td>
</tr>
<tr>
<td>External walls and finishes</td>
<td>360 m²</td>
<td>$100</td>
<td>360,000</td>
</tr>
<tr>
<td>Internal walls and finishes</td>
<td>180 m²</td>
<td>$180</td>
<td>32,400</td>
</tr>
<tr>
<td>Roof carpentry and finishes</td>
<td>150 m²</td>
<td>$150</td>
<td>22,500</td>
</tr>
<tr>
<td>Roof covering</td>
<td>150 m²</td>
<td>$50</td>
<td>7,500</td>
</tr>
<tr>
<td>Doors</td>
<td>20 m²</td>
<td>$300</td>
<td>6,000</td>
</tr>
<tr>
<td>Windows</td>
<td>100 m²</td>
<td>$200</td>
<td>20,000</td>
</tr>
<tr>
<td>Plumbing and air-conditioning</td>
<td>450 m²</td>
<td>$200</td>
<td>90,000</td>
</tr>
<tr>
<td>Electrical (allow)</td>
<td></td>
<td></td>
<td>31,000</td>
</tr>
<tr>
<td>Adjust for cost escalation to completion</td>
<td></td>
<td></td>
<td>40,000</td>
</tr>
</tbody>
</table>

Total budget 1,059,400
say 1,060,000

Approximate quantities and detailed quantities will be covered in Chapter 9.
Chapter 5

Measurement

Introduction

This chapter gives examples of methods used to ensure both consistency in setting out dimensions and clarity in measuring.

The degree of accuracy necessary for builders' bulk quantities is determined by the cost significance of the item. The Australian Standard Method of Measurement (SMM) determines the accuracy of all formal quantities.

Irrespective of the type or purpose of quantities, consistency, clarity and accuracy are essential.

Setting out

The clear and logical setting out of descriptions, dimensions and notations is an essential part of the work of a quantity surveyor and especially so within the draft bill of quantities.

Many students fail to realise the importance that examiners attach to this aspect of their work. Work which is clear and follows a logical sequence will gain marks. In practice, a quantity surveyor must be able to justify not only what was done but why it was done, at any time between a few days and a few years later.

There are many acceptable methods of setting out, and much depends upon individual office practice. There is no one universal method. The system demonstrated below is based on the billing direct system and incorporates some recommendations with a view to reduction of human error.

The following terms are used:

- **Measuring** is writing an appropriate description with the required unit of measurement (ie metres, square metres, cubic metres, tonnes etc), followed by logically set-out dimensions ready for calculation. Any minor calculations needed to build up a dimension, mean girth or similar should be calculated by the quantity surveyor (in the form of a sidecast or waste calculations – see definition overleaf).

- **Billing** is the process of completing all the calculations and obtaining a final total quantity for each item, which in formal quantities is rounded off to the accuracy required by the SMM. In practice, this task is not normally done by the person who is responsible for the measuring.

Measuring and billing are separate and distinct. It is therefore wrong for students to carry out these tasks simultaneously unless specifically told to do so.
• **Sidecast or waste calculations** are minor calculations done by the quantity surveyor within the central wide column. These are done off to the side of the main dimensions or before any main dimensions if this is practical but, in any case, within the wide central columns. This type of calculation is done in order to build up a number or dimension needed by the quantity surveyor in their measuring but not directly obtainable from the drawings.

For example, a mean girth is usually done as a sidecast. Some quantity surveyors present all sidecasts (and other dimensions) to two decimal places, whilst others prefer to extract dimensions from drawings to sidecasts to three places (ie in millimetres) and use only two places within the main dimension column. This is really a matter for office practice to decide.

• **Taking off** is a term sometimes used in preference to measuring. Depending upon the individual quantity surveyor, it may or may not mean fully the same. Here the two terms will be used as completely equivalent (ie to include a description of the work, unit of billing and the relevant set of dimensions ready for calculating by others).

**Page ruling**

Look at the layout of a bill on the following pages. The layout demonstrated is a recommended one, not a universal standard. It must be understood that there is no standard ruling, nor any standard paper, since both of these depend upon office practice. The differences from office to office are, however, minor and need not concern us here.
# Standard setting out format

NOTE: Always write in ink.

<table>
<thead>
<tr>
<th>Description</th>
<th>Margin</th>
<th>Timesing column</th>
<th>Dimension column</th>
<th>Squaring column</th>
<th>Waste column</th>
<th>(Maximum extent)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NUMBER</strong></td>
<td>DO NOT WRITE HERE</td>
<td>5</td>
<td>Indicates 5 numbers</td>
<td>5 pieces</td>
<td>5 off</td>
<td></td>
</tr>
<tr>
<td><strong>LENGTH</strong></td>
<td>DO NOT WRITE HERE</td>
<td>5.20</td>
<td>Indicates 5200 mm long</td>
<td>or 5.2 metres</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>AREA</strong></td>
<td>DO NOT WRITE HERE</td>
<td>2.70</td>
<td>Indicates 2700 mm long</td>
<td></td>
<td>multiplied by 790 mm wide</td>
<td></td>
</tr>
<tr>
<td><strong>VOLUME</strong></td>
<td>DO NOT WRITE HERE</td>
<td>13.87</td>
<td>Indicates 13870 mm long</td>
<td>2.96</td>
<td>Multiplied by 2960 mm wide</td>
<td>1.34 Multiplied by 1340 mm high or deep</td>
</tr>
<tr>
<td><strong>TIMESING</strong></td>
<td>DO NOT WRITE HERE</td>
<td>2/</td>
<td>Indicates 2 x 2100 mm</td>
<td>8.50</td>
<td>Indicates 9 x 3 x 2 x 6.500 x 4200 mm</td>
<td>4.20</td>
</tr>
<tr>
<td><strong>DOTTING-ON</strong></td>
<td>DO NOT WRITE HERE</td>
<td>1.2/</td>
<td>Indicates (2+1) x 7800 mm</td>
<td>4.20</td>
<td>Indicates (4+3) x 2 x (7+5) x 4200 mm x 3750 mm</td>
<td>3.75</td>
</tr>
<tr>
<td><strong>ITEM</strong></td>
<td>DO NOT WRITE HERE</td>
<td>No dimensions or squaring</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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### SQUARING

<table>
<thead>
<tr>
<th>Margin column</th>
<th>Timesing column</th>
<th>Dimension column</th>
<th>Squaring column</th>
<th>Waste column</th>
<th>(Maximum extent)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>5</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>7</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8</strong></td>
<td></td>
<td></td>
<td><strong>20</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>3.20</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>2.70</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>8.90</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td><strong>14.80</strong></td>
</tr>
<tr>
<td><strong>20.12</strong></td>
<td></td>
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<td><strong>3/2/</strong></td>
<td><strong>3.28</strong></td>
<td><strong>1.34</strong></td>
<td><strong>5.97</strong></td>
<td><strong>236.15</strong></td>
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<td><strong>3/7/</strong></td>
<td><strong>12.33</strong></td>
<td><strong>6.19</strong></td>
<td><strong>3.97</strong></td>
<td><strong>16968.06</strong></td>
<td><strong>17648.28</strong></td>
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<tr>
<td><strong>/5/</strong></td>
<td><strong>16.09</strong></td>
<td><strong>3.27</strong></td>
<td><strong>2.11</strong></td>
<td><strong>444.07</strong></td>
<td><strong>17648.28</strong></td>
</tr>
</tbody>
</table>

Indicates $5 + 7 + 8 = 20$ (Total)

Indicates $2.70 + 8.90 = 14.80$ (Total)

Indicates $(20.12 \times 3.87) + (3.75 \times 2.13) + (6 \times 2 \times 2.33 \times 1.11)$

Indicates $3 \times (2 + 1) \times 3.28 \times 1.34 \times 5.97 + (3 + 5) \times 7 \times 12.33 \times 6.19 \times 3.97 + \frac{1}{2} \times 4 \times 2 \times 16.09 \times 3.27 \times 2.11$

Indicates $3.20 \times 3 \times (2 + 1) \times 3.28 \times 1.34 \times 5.97 + (3 + 5) \times 7 \times 12.33 \times 6.19 \times 3.97 + \frac{1}{2} \times 4 \times 2 \times 16.09 \times 3.27 \times 2.11$

Indicates $6 \times 2 \times 2.33 \times 1.11$

Indicates $116.89$ (Total)

Indicates $17648.28$ (Total) Cubic metres
### CORRECTIONS

Do not alter figures in the dimension column. Write the word 'NIL' in the squaring column and bracket the dimensions to be cancelled.

Write the correct dimensions in as follows:

<table>
<thead>
<tr>
<th>Margin</th>
<th>Timesing column</th>
<th>Dimension column</th>
<th>Squaring column</th>
<th>Waste column</th>
<th>(Maximum extent)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3.50</td>
<td></td>
<td>1.28</td>
<td></td>
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<tr>
<td></td>
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<td></td>
<td>4.20</td>
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<td>0.86</td>
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<td></td>
<td>2.72</td>
<td></td>
<td>1.13</td>
<td></td>
<td>1.13</td>
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<tr>
<td></td>
<td>4.36</td>
<td></td>
<td>0.96</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### DEDUCTIONS

Use the word **DEDUCT** with an arrow to indicate the start of deductions. Write deductions in the timesing column to avoid possible confusion. When more additions are required, write the word **ADD** with an arrow to indicate the start. Deductions or additions finish where a heading indicates a switch to the other, as follows:

<table>
<thead>
<tr>
<th>Margin</th>
<th>Timesing column</th>
<th>Dimension column</th>
<th>Squaring column</th>
<th>Waste column</th>
<th>(Maximum extent)</th>
</tr>
</thead>
<tbody>
<tr>
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<td>8.28</td>
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<td></td>
<td>4.33</td>
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<td>13.77</td>
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<tr>
<td><strong>DEDUCT</strong></td>
<td>1.29</td>
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<tr>
<td></td>
<td>5.32</td>
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<td></td>
<td>3.46</td>
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<tr>
<td></td>
<td>10.07</td>
<td></td>
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<td></td>
<td>3.70</td>
</tr>
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<td><strong>ADD</strong></td>
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<td>3.00</td>
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<td>2.00</td>
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<td></td>
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<td>7.30</td>
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<tr>
<td></td>
<td>11.00</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Sub-total**

**Answer**
WASTES

Wastes are not scribbles. They are proper calculations, eg mean girths, notes, references and assumptions. All these must be written down in the waste column, NOT memorised. They must not be written in the description of the item. Keep wastes within the areas indicated.

<table>
<thead>
<tr>
<th>WASTE or MAXIMUM EXTENT</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 walls</td>
</tr>
<tr>
<td>Bedroom 1</td>
</tr>
<tr>
<td>6.97</td>
</tr>
<tr>
<td>Bedroom 2</td>
</tr>
<tr>
<td>3.72</td>
</tr>
<tr>
<td>Living Rm</td>
</tr>
<tr>
<td>2.98</td>
</tr>
<tr>
<td>Dining Rm</td>
</tr>
<tr>
<td>6.72</td>
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<tr>
<td></td>
</tr>
<tr>
<td>W.C.</td>
</tr>
<tr>
<td>2.10</td>
</tr>
<tr>
<td>Bath</td>
</tr>
<tr>
<td>1.97</td>
</tr>
<tr>
<td>3.21</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>2.10</td>
</tr>
<tr>
<td>30.89</td>
</tr>
<tr>
<td>144.68</td>
</tr>
</tbody>
</table>

DEDUCT

| 3/ | 0.90 |
|    | 2.10 | 5.67 |
|    | .80  | 1.68 |
|    | 0.70 | 1.47 |
| 2.10 | 8.82 |
|      | 135.86 |

NOTE: % denotes transfer.
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Procedure for measuring and billing an item

Refer to the bill shown on the opposite page while reading these steps.

**Step 1**
Write full descriptions of the item to be measured according to trade practice or SMM, depending upon the type of quantities required. Do not write notes or references here.

**Step 2**
Check trade practice or SMM to ascertain the unit of measurement and write it against the last line of the description.

**Step 3**
Draw a line (under Steps 1 and 2) to separate descriptions from later measurements.

**Step 4**
Do all preliminary (not rough) calculations. Write all notes, references and assumptions here.

**Step 5**
Write down one, two or three dimensions according to whether the measurement involves a number, length, area or volume.

**Step 6**
Calculate number, length, area or volume represented by each set of dimensions and enter answer in squaring columns and calculate total of all these squared dimensions.

**Step 7**
Check trade practice or SMM and write correct quantity against UNIT.

**Note:** Always write in ink.
General recommendations

Consistency in the choice of dimensions in measuring is essential for clarity and the reduction of error. This resource recommends that, where appropriate, measuring begins from the left-hand corner of a building and continues clockwise and generally from the top down. Measurements are simplified if taken overall with voids and re-entries deducted. It is desirable to have the maximum amount of waste and the minimum amount of main dimensions.

Firstly, check drawings to ensure that overall dimensions reconcile with the sum totals of dimensions within the same parameters. Figured dimensions should be used in preference to scaling.

Measuring goes beyond producing an answer in metres. The quantities provide a record in the event of future queries or claims or variations. A mass of figures without any apparent order or logic would be of little assistance.

With this in mind:

a) Remember the separate groups of ‘waste’, ‘adds’ and ‘deducts’.

b) Avoid overcrowding. Spread your work out and use plenty of paper.

Also avoid any tendency to calculate main dimensions at the time of setting them down or shortly afterwards. Inconsistencies in the drawings, or just human errors, often result in alterations to the quantities, which means, of course, that any squaring done too early could well be in vain.

Finally, it is recommended that taking off is a process to be done slowly and painstakingly. Measuring cannot be hurried. This applies especially to the novice. Make a careful study of the drawing first of all. Have you ever had to amend your quantities because you misinterpreted a drawing?

These, then, are the main basic rules:

a) Pay attention to the setting out.

b) Girth whenever possible.

c) Don’t be in a hurry to square the dimensions.

d) Proceed slowly and carefully. Study the drawings well before you start.

e) Use plenty of signposts.

f) Try to use as few main dimensions as possible.

g) Measure overall, and deduct openings or voids, wherever possible.
Chapter 6

Quantities for tendering based only on specification and drawings

Bulk quantities

Bulk or builders’ bulk quantities (so-called all-inclusive major items of work) are those prepared by builders’ quantity surveyors when tendering on medium-sized projects based on specification and drawing documentation (see also Chapter 3). Each builder measures individual quantities to aid the preparation of the estimate. The degree to which trades are measured will vary in practice according to the size and complexity of the trades, the time available and the approach of the individual builder. The builder may choose to sublet many of the trades but is ultimately responsible to the client as party to the main contract. The method of measuring is often determined by the classification of the building.

Minor works

Whilst greater accuracy is achieved by more detailed measuring, the scope of minor works allows prices to be compiled in the most convenient manner. In minor works it is often more convenient to measure ordering quantities and price labour separately.

Project housing

The project home industry, because of the repetition involved, often utilises computers to aid the scheduling of materials, which is taken from standard quantity lists for all of the different types of home designs. In most instances, it is appropriate to measure ordering quantities and price labour separately.

Architect-supervised work (‘one-off’ housing, commercial and industrial)

The procedural examples that follow are representative of those used for general architect-supervised work and when measuring work documented by specification and drawings.

Subletting

The builder will divide the work into:
- that to be priced by themself;
- that for which subcontractors will give a price.

Having determined the extent of the work to be sublet, decisions must then be made as to the basis on which the builder will obtain the subcontract price for each item of work. There are two options:

Option One:

An all-inclusive price for work to be done.
Option Two:
A schedule of unit rate (or rates). This will necessitate the builder measuring
the work involved and applying the subcontractor’s rates, thus arriving at the
overall cost. The question of ‘waste’ must be clearly resolved between builder
and subcontractor at the time of agreeing to the subcontract rate. Is waste to be
included in the builder’s quantities or the subcontractor’s rates? In this resource, it
is recommended all quantities be measured net – that is, waste and other factors
affecting the price are included in the unit rate.

Which option?
Which option will the builder adopt? It is not so much a matter of one method being
superior to the other but, rather, which option is more suited to the builder’s own
tendering and subletting policies. Most builders would operate on the basis of the
first option – that is, lump-sum quotes from subcontractors for labour, or labour and
materials, plus the assessment of the cost of materials supplied by the builder.

In either event, the builder will be involved in taking off quantities. If the subcontractor
submits packaged prices for labour, remember that it is up to the builder to determine
the quantity and subsequent cost of the materials.

Amount of detail
How will the quantities be measured? To what extent? To what degree? One thing is
certain: there will not be time (nor is there the need) to measure to the detail practised
by the quantity surveyor in the preparation of a formal bill of quantities.

What is required are reasonably detailed and accurate quantities. Typical techniques
for achieving an acceptable level of accuracy for housing are given below.

a) Footings
Take the mean girth of the external walls for external footings and the total length
of internal walls which have concrete thickening under them.

b) Toe to slab
Use the mean girth of the external walls.

c) External facings
Use the external girth of the outer leaf. Deduct all openings. Convert total square
metres to number of bricks if necessary.

d) Common brickwork
Use the internal girth of the inner leaf. Deduct the area of openings as calculated
for external facings. Add the area of internal walls. (The total length has already
been determined.) Deduct the area of internal door openings. Convert total square
metres to number of bricks if necessary.

The metres of damp-proof course and flashings can be obtained from the
brickwork girths.
e) **Roof framing**
   For tendering purposes, it could be sufficient to include these costs on the basis of square metres of roof area (measured flat on the plan). Alternatively, measure material in metres. It will be necessary for the individual builder to carry out their own research into costs. Lengths of gutter and fascia and eaves lining areas can be obtained from the overall roof dimensions.

f) **Joinery**
   Take doors, frames, windows (timber or aluminium) and cupboards by numbers or on a square metre basis. The areas of door and window openings are available from the brickwork deductions.

g) **Ceiling linings**
   Measure overall between the external walls and deduct the plan area of the internal walls (length of internal walls extracted from common brick or concrete footings).

h) **Plastering**
   It is quite common to ignore door and window openings and allow the consequential over-measurement to compensate for narrow widths and labour to angles. If this policy is adopted (which seems to suit the majority of plastering subcontractors), it is a simple matter to extract the internal girth of the external walls and the length of the internal walls from the common brickwork. Don't forget to double the internal walls for plastering both sides.

i) **Other finishes**
   Measure net areas.

j) **Painting**
   To measure painting, extract the dimensions and areas from the appropriate calculations – for example, fascia, gutter, doors, plastered surfaces etc.

The above suggestions do not, of course, constitute a complete list. They are intended only to outline a reasonable approach which should result in a sufficiently accurate tender.

**Other extras**
Many other items have to be taken into account, examples of which are:

- site clearance
- filling
- dewatering
- termite treatment
- paths, driveways, crossover
- mirrors
- electrical
- meter box
- clothes hoist
- beams
- skirtings
- wall and floor tiling
- mechanical
Compiling tenders

Each project is unique. The degree of measuring accuracy required and the cost-significant items that require pricing will be determined in each case by the specification and drawings. When tendering, the size of the project and all contract documents pertaining to the above must be fully taken into account.

It is in the builder’s interest to have a complete appreciation of the credibility of all prices inserted in the tender. They can achieve this appreciation by examining the quantities and the unit rates of the cost-significant items in the overall price. Estimates are usually compiled trade by trade. Common means of compiling trade prices for commercial projects are outlined below.

a) Earthworks

Invite an all-inclusive lump sum from subcontractors.

NOTE:
- Basic cost-significant items in the earthworks trade are excavation and filling, measured by the cubic metre.
- The specification and drawings must be read closely to determine the cost significance of any requirements for compaction, trench excavation and dewatering.
- Measure the area of the site to be treated with insecticides and herbicides and call for unit rates from subcontractors. Make sure vertical surfaces (e.g., sides of trench) requiring treatment are measured.

Although in practice lump-sum quotes would form the basis of pricing the excavator trade, it is in the builder’s interest to be able to break down a quote into the common cost-significant areas. To establish this, bulk quantities for the excavator trade for the building would be taken.

b) Site works

Invite an all-inclusive lump-sum price from subcontractors. If it’s decided to take quantities, measure areas of roads, length of kerbs and fencing and the like.

c) Concrete work

The structure is a key element in the construction process. The builder usually organises the delivery of the concrete for placing by subcontract gangs. The other cost-significant factors of the concrete trade are formwork and steel reinforcement. The methodology of formwork is of a specialist nature and lump-sum prices are invited from subcontractors. Quantities of the face area of formwork to be formed may be taken to establish a rate per square metre for checking purposes.

Reinforcement supply companies employ specialist schedulers for taking off quantities from drawings and to produce bending schedules so lump-sum quotes for supply can be given. Labour-only rates for fixing are called, based on the quantities of materials to be supplied. The unit of measuring is the tonne. Bar reinforcement is measured in metres and converted to tonnes by multiplying lengths by the kilogram weight per metre. Fabric reinforcement is measured in square metres and trench mesh in linear metres; rates include for waste on materials.
The structure of the pricing for a concrete trade might thus appear:

**Concrete**
Quantities of structural components (eg footings, slabs, beams and columns) are measured separately in cubic metres. This is because elements incur different costs in placing because of location or strength.

**Formwork**
All-inclusive lump sum from subcontractors. Face area of concrete to be formed may be measured in square metres as an aid to checking credibility of tenders.

**Steel reinforcement**
Lump sum for supply of material only. Lump sum or rates per tonne for fixing. Fabric and trench mesh usually included in labour price for placing concrete.

The specification and drawings must be read closely to determine the cost significance of any requirements with regard to curing, testing and control joints.

d) **Brickwork**
Along with concrete work, the brickwork trade can be crucial to the progress of a project. Brickwork is commonly priced for different thickness both on rates per square metre and rates per thousand bricks. A composite unit rate, inclusive of bricks, mortar and sundries (such as brick ties and waste), is built up to include the labour content. Other aspects of work associated with the trade (ie lintels, flashing and damp-proof courses) are determined from the specification and drawings and measured in units appropriate for composite rates to be allocated – for example:
- special bricks m or no.
- steel angle lintels tonne
- flashings m
- brick reinforcement m
- damp-proof courses m
- cutting m.

Descriptions must be sufficient for the estimator to allow for the specification requirements of the unit measured.

e) **Carpentry and joinery**
For clarity, the trade is measured in constructional elements (eg roofing, floors, partitions) followed by items in the internal fit-out (eg skirting, doors, fittings and hardware).

Specialist work such as roof trusses and cabinet work would be the subject of lump-sum quotes, thus allowing flexibility in the design and construction. The miscellaneous nature of the trade usually requires other work to be measured out. Common units of measure are square metres for flooring, sheeting and the like, linear metres for skirting and structural members and numbers of doors.
Remember, bulk quantities measure labour and material for pricing work fixed in position, so material invoicing units are not necessarily adhered to. However, the drawings and specifications have to be read closely to ensure that the correct type, grade and finish of timber and fixing requirements are described.

f) **Plastering and tiling**

The builder will engage a team of supply and fix subcontractors to carry out the plastering and tiling work. They usually quote on a square metre basis. Rates are based on gross areas measured over openings to compensate for narrow widths and angles at reveals. Drawings and specifications and finishing schedules need to be closely read to ensure the correct type and finish of plaster is taken. Areas of plaster cover to walls are taken once only, despite the number of coats. Descriptions identify the number of coats and the estimator prices accordingly.

g) **Structural steelwork**

An all-inclusive lump sum is called from subcontractors, to include the provision of shop drawings and the delivery, hoisting, erection and plumbing of steelwork. In addition, the builder will have to allow for a surveyor to check the steelwork and for the grouting of base plates.

h) **Metalwork**

This trade includes a miscellany of items ranging from aluminium windows to pergola brackets. The majority of items can be enumerated and lump-sum or unit rates are called from subcontractors on an all-inclusive or supply-only basis.

i) **Specialised areas**

Some trades are becoming increasingly specialised – and here the measurement of quantities is best left to the suppliers or subcontractor of the trade to ensure that all requirements are met. Consequently, lump-sum quotes would be called for tile or sheetmetal roofing, plumbing and drainage, glazing, painting and building services such as electrical and air-conditioning.

The builder must check all quotes to determine the responsibility for provision of scaffold, storage and the like and ensure that any grey areas of work between trades and attendance on the trades have been allowed for.

The specification should be checked thoroughly against items ordered to ensure everything has been allowed for.

**Summary**

Although industry practice determines the most sensible and economic way to price the various trades, it must always be remembered that the builder is the party with a client to a building contract. Consequently, they are responsible for all trades and must be confident of the estimates in a tender. The builder must be aware of precisely what subcontractors have allowed for in quotations and have some knowledge of how costs have been distributed.
Chapter 7

Formal quantities

Introduction

Whilst the basic measuring procedures are similar to those used for bulk quantities, items are measured in accordance with a standard set of principles. Refer back to Chapters 2 and 3 to clarify the major differences between use of bulk and formal quantities.

Bulk quantities are measured by an individual builder from finalised specification and drawings during the tender period. Formal quantities are prepared by a consultant quantity surveyor two or three months before a contract for construction is signed and are used as a basis for the preparation of the tender.

The Australian Standard Method of Measurement

Bills in Australia are based on the Australian Standard Method of Measurement of Building Works, commonly called ‘SMM’. This document is produced by the Australian Institute of Quantity Surveyors and Master Builders Australia. In order to meet the ever-changing needs of industry, and to cover new ways of constructing and pricing projects, the SMM is revised from time to time by a joint committee which works from recommendations of the members using the document.

In this resource, the 5th edition of the SMM is used as the basis for examples and explanations. The purpose of the SMM is to provide a uniform basis for the measurement of building works and for the presentation of units of measurement in bills of quantities.

The SMM recommends the principles of measurement, and units of measurement, and the order of presentation in a bill. While it is well to remember that the SMM is a set of recommendations, not rules, it would be unwise to depart from them without good reason, since to do so could easily cause confusion among tenderers and others using the bill. However, buildings vary tremendously and departures from the SMM are sometimes necessary. Such departures should be made clear in the bill, the descriptions pointing out what has been done so that confusion and ambiguity are eliminated. Always be prepared to support any such departure with full and sound reasoning. As a rule, something which is not specifically covered by the SMM should be described and measured in accordance with the general principles that govern the SMM as a whole – in a logical, clear and concise fashion with net quantities.
This principle of measuring net dominates the whole of the SMM. It will be readily appreciated that the builder, in ordering materials, must take into account the waste which will inevitably occur – that is, they will order more than is actually required for the job. But no two tradespeople create exactly the same amount of waste – and waste is also affected by climatic conditions, accidents and the actual nature of the material, as well as the minimum quantity which a supplier will sell. Only the tenderer can assess the company’s efficiency, as each company will differ. The quantity surveyor therefore cannot assess waste while preparing the bill. Similarly, only the builder knows what size of sheets, lengths of rolls, types of machines and lengths of trucks they intend to use in most cases; therefore, with a few exceptions, the quantity surveyor cannot know what or where laps in materials will occur, and cannot make an allowance for them in the bill.

Consequently, the only way to put all tenderers on an equal basis is for the bill to be prepared on a net basis, with quantities measured as they will be found when fixed in their finished position. The tenderer then has the onus of including an allowance for waste in their unit rates and the builder’s quantity surveyor, in ordering materials, will order not straight from the bill, but adjusted true lengths etc.

To summarise: the SMM gives a uniform method to be adopted by all quantity surveyors in the measurement of building works. It dictates the unit of billing for particular items and the allowances to be made for waste (generally no allowance). It defines the opening sizes which are not deducted. It offers suggestions regarding preambles and preliminary items. This publication is of the utmost importance.

**Measuring and drawings**

The SMM should always be the starting point in any discussion of formal procedure. However, it must also be borne in mind that, in questions of description of methods of construction, the drawings and specification are the primary sources of information. The SMM is concerned only with quantities, classifications and units of measurement.

While it is acknowledged that statutory requirements are important, that importance affects quantity surveying only indirectly, in as much as they affect the drawings and/or specification which in turn affect the quantity surveyor’s work. Should the drawings and/or specification (for any reason) not comply with such requirements, this is really of little concern to the quantity surveyor other than the fact they might draw the discrepancy to somebody’s attention. The bill must agree with the drawings and specification. This is so because any subsequent change in one document must affect all other documents equally; otherwise confusion arises as to the effect (and cost) of the change. And, of course, some clients are exempt from statutory requirements.
Principles of measuring

Bills of quantities are prepared trade by trade. That is to say, one trade will be completely measured before the next is begun. While the bill follows generally the actual order of building operations, it does not do so exactly.

Individuality plays a large part in taking off; the approach must vary according to the individual and according to the particular project.

However, experience has shown that the observance of certain rules and principles will not only simplify matters but also help considerably in efforts to avoid mistakes.

Measuring goes beyond producing an answer in metres. The quantities provide a record in the event of future queries or claims or variations. A mass of figures without any apparent order or logic would be of little assistance.

With this in mind:

a) Remember the separate groups of ‘waste’, ‘adds’ and ‘deducts’ mentioned in Chapter 5.

b) Avoid overcrowding. Spread your work out and use plenty of paper.

Units of billing

There are six different units used in bills: metres, square metres, cubic metres, tonnes, number and item.

The first four of these are fairly self-explanatory and are in common use. Number (or no.) is used for things such as doors, locks, basins and baths and anything else which is bought as a complete unit (things for which the first four units of billing would not be appropriate). On the other hand, item is used where the work described either cannot be quantified or, if it can, the expected price would not be evenly proportional to the quantity that can be measured. For example, curing concrete is an item because the cost is not proportional to either the volume or the surface area measurable and, of course, prime cost (PC) and provisional sums are items because the quantity cannot yet be properly assessed.

The SMM deals with the final accuracy to which units of billing should be rounded off, and students are advised to learn its intent.

In accordance with the SMM, final billed quantities are rounded off to the next whole number. When the unit of billing is tonnes, the final quantity should be stated to one-hundredth of a tonne (ie to two decimal places, as per rule 6).

In measuring bar reinforcement, for instance, the final quantity should always show two decimal places, for example:

12 mm diameter steel bar reinforcement in strip footings as specified

\[
t \quad 66.66
\]

This is the only time a decimal should appear in the final billing. In fact, even if the billed quantity is by chance a whole number, the two decimals should still appear thus: 67.00, not just 67.
Query sheets

Inevitably in taking off quantities, information is required which is either not clear or is non-existent on the drawings. Occasionally a quantity surveyor may find that some minor detail on one drawing will conflict with information on some other drawing of the same work. In either case, the quantity surveyor has no implied right to make their own decisions. Only the architect or their authorised representative has the right to amend drawings or to make decisions with regard to anything drawn or specified.

In order to minimise disturbance to the architect, it is customary not to contact the architect immediately any such problem arises but rather to work around the difficulties, waiting until a reasonable number of queries are found and then presenting them as a group, daily or weekly as the size and type of job permits.

Methods and format of presentation of course depend on office practice and vary tremendously. One recommended format is as follows:

<table>
<thead>
<tr>
<th>Date question presented</th>
<th>Query no. drawing or reference no.</th>
<th>Question</th>
<th>Answer</th>
<th>Date of answer</th>
<th>Name of person answering</th>
</tr>
</thead>
</table>

Whatever format is adopted, it is essential that the name of the person authorising the answer (or change to documents) and the date of that answer are recorded, to eliminate possible problems between the quantity surveyor and the architect at a later stage.

The quantity surveyor should attempt to ensure that documents presented to tenderers comply with the answers given, so that all tender documents are in agreement. This is often seen as a rearguard action by the quantity surveyor but is also protection for the tenderer (ensuring a fair basis for tendering) and, eventually, for the proprietor, ensuring minimal variations arising from discrepancies between the contract documents.

Preliminaries

Section 2 of the SMM deals with preliminaries (commonly called prelims) in detail – far more detail than here, since in general the prelims in a bill follow almost exactly the prelims in the specification, modified if necessary to suit SMM requirements.

The purpose of a prelims section is to provide the tenderer with somewhere to price items of project overheads, site establishment and site organisation, insurances and temporary works such as sheds, scaffold, hoardings, gantries etc required for the use of all trades (or the majority of them) for the duration of the construction period.
It should be noted that some SMM clauses list particulars which should be stated in the bill to inform the tenderers (and later the builder) about the project. Other clauses list things for which ‘items shall be given’ – that is, listed in the bill in a manner which invites pricing although no quantity is measurable or price is not necessarily related to quantities which are measurable. Notice use of the term ‘invite pricing’. This is because there can be no compulsion upon builders (or tenderers) to price each and every item, no matter how desirable this would be. However, if, in a given contract, individual items were not priced, it would be argued that the builder was bound by their tender price, which would be deemed to include the seemingly unpriced items – that is, it would be assumed that they had in fact been assessed and spread throughout the rest of the bill prices, just as the builder’s office overheads and profit margin should be.

In general, prelims are divided into four main sections:

- notices to tenderers and general information
- conditions of contract
- site establishment or builders’ administration requirements
- monetary allowances.

Preambles

The SMM outlines the purpose of a *preamble* as being to facilitate pricing and not to support or supersede the other documentation.

This raises the questions of what a preamble is – and how it does facilitate pricing.

The idea basically is to outline, for the aid of the tenderers, any points on the method of sectionalising the work or on how the work was measured which the quantity surveyor feels the tenderer might not easily realise from reading the bill, as well as to underline any items in the other documents which affect costing of items within a particular section of work in the bill.

Preambles, then, are notes given by the quantity surveyor at the beginning of each major section of the works for the elucidation of tenderers in pricing the measured work. Preambles are not necessarily provided only at the beginning of each trade; for example, there may also be preambles to formwork and reinforcement in the concrete section.

Preambles are not normally priceable in themselves, do not give new information and should not contradict other documents. Preambles also have the effect of reducing much of the descriptive matter in bills by taking out the ‘common factors’ and putting them in the front for easy reference. To this end, the preamble for each trade contains the note: ‘Refer to relevant specification sections containing the particulars.’
Summary of the SMM

The SMM is a list of recommendations qualifying and describing the cost-significant items of a building to facilitate uniform tendering.

It is structured into sections originally based on trades:

- Groundworks
- Demolition
- Concrete
- Masonry
- Structural steel
- Metalwork, including windows
- Woodwork, including doors
- Glazing
- Hardware
- Roofing
- Plumbing
- Drainage
- Finishes
- Glazing
- Painting.

Each trade section contains:

a) **preambles** – general information of intent to the estimator, to be stated but not measured (measurement and prices)

b) **general notes** – information regarding minimum deductions and definitions

c) **measuring procedures** – information on the specific work items to be measured, with the units of measure to be adopted, that is m³, m², m, tonnes, number or item.

This can be illustrated as follows:
SMM: basic format of content of all trades

TRADE SECTION

PREAMBLES

GENERAL NOTES

MEASURING PROCEDURES

eg:

(i) statement of operations not to be specifically measured but to be included in prices by estimator

major unit of measure general instructions

specific items to be measured

(ii) items not measured but to be listed by professional quantity surveyor in order to aid pricing

minimum deductions billing

units of measure definitions
Chapter 8

Contracts

Introduction

The remainder of this resource is designed to give you some insight into tendering and contract administration procedures: how to go about compiling a tender, what to include and what steps to take, and then how to administer contracts.

Contracts

Before dealing with various forms of building contract and the rights and obligations of the parties to a building contract, this chapter will define the term contract and consider the essential elements which constitute a valid contract.

Definition

A contract is an agreement that the courts will enforce. It is an agreement concerning rights and obligations and is intended to be enforceable at law. It is created between the parties expressly or implied and is about something to be done or not to be done in the future.

The contract is binding on the parties and each party has rights and/or obligations; if those rights or obligations are breached, a court of law will require the defaulting party to carry out their obligations.

This concept and the fact that we have a ‘C’ for ‘contract’ lead us to ‘the four Cs’ surrounding a contract. These are:

1. Certainty – the formalising of an agreement by a definite contract gives a certainty to the terms and conditions.
2. Control – through the effort to define with certainty the parties’ rights and obligations, each party obtains a degree of control over the exercise and the discharge of those rights and obligations.
3. Coercion – having established with certainty what the contract is all about and controls on the conduct of both parties, the contract provides the ability to coerce a party in order to achieve the original desired objectives, by having the law as the overseer.
4. Compensation – if everything fails, despite the certainty and control built into a contract, the law provides a mechanism to compensate for any losses incurred through non-performance or incomplete performance, by either party, in relation to obligations under the contract.
Essential elements of valid contracts

If there is no agreement between parties, there can be no binding contract. The question is, then, what is an agreement? Contract law treats the notion of ‘agreement’ somewhat differently from commercial people. Commercial people may be ‘in agreement’ yet there may be no ‘agreement’ sufficient to form a contract. A court will look at what elements essential to a valid contract are present and, if not all are present, the contract will be declared invalid.

The following are essential elements of a valid contract.

Offer and acceptance
One party (offeror) makes an offer, which the other party (offeree) accepts. That is, promises are exchanged.

Form and consideration
Parties exchange promises in consideration for some act to be executed in the future.

They must be:
- certain
- sufficient
- relating to present or future (not the past)
- between parties to contract
- legal.

Legal capacity of parties
Parties must be legally capable of entering into a contract – for example, unincorporated associations have no capacity to make a contract and minors, intoxicated persons, people with a mental impairment and bankrupts have a very limited legal capacity in regard to being able to enter into a contract.

Genuineness of consent
Consent to being a party to a contract must be genuine. If it can be proven that consent was induced on one party by duress, undue influence or misrepresentation of the facts (innocent or fraudulent), the contract is voidable. Also, if one party accepted the other party’s offer but it can be proven that mistakes were made in the described offer, consent may have been induced and the contract may be declared void.

Legality of object
The act to be promoted by the agreement must be legal, either expressly or implied, and certain acts are strictly prohibited, such as those which would:
- be a crime
- promote sexual immorality
- corrupt public life.

An agreement cannot be legally binding if it concerns acts of this nature.
**Intention to create legal relations**
The intention to enter into legal relations must be present in parties to the agreement.

**Classes of contract**
Contracts can be classified as:
- contracts of record – court orders or instructions
- speciality contracts – formal written contracts under seal
- simple contracts – written or verbal agreements.

**Discharge (determination) of contracts**
Most contracts are successfully completed or performed when parties to the contract have completed precise fulfilment of promises; however, discharge of a contract can be enforced prior to *performance*.

**Waiver**
If work has not been started on a contract, parties may waive their rights and obligations by mutual consent.

**Agreement**
The mutual consent of parties involved may also allow a contract to be discharged at any stage.

**Impossibility of performance**
Circumstances or certain conditions may arise which prevent fulfilment of promises, for example:
- rezoning of land
- natural disaster
- war.

Parties may be discharged from their obligations under any such eventuality.

**Operation of law**
If one party is declared bankrupt, this prevents their being party to the contract. Also, change to members of a partnership or company requires a new agreement to be entered into, normally based on the previous rights and obligations.

**Breach of contract**
If one party refuses to abide by the terms of the contract, the other party may terminate the contract and sue for any loss (damages) which has occurred as a result of that refusal to honour the agreement.
Building contracts

A building agreement is a contract whereby one person or party agrees to perform building works for another, normally in return for an agreed amount of money. Such agreements vary enormously regarding subject matter, terms and form. No firm decision might be made regarding the price – and the matter of payment may not even be mentioned. However, the law implies that a reasonable price is to be paid and the work is to be executed with proper skill and care, and with satisfactory materials.

Whatever form the building contract takes, the documentation will invariably include:

- conditions of contract
- specification
- drawings
- bill of quantities/other.

These regulate in minute detail the work to be done and the relations of the parties.

Figure 8.1 illustrates the relationship and obligations of parties to a typical building contract.

![Diagram showing the relationship and obligations of parties to a typical building contract.](image-url)

**Fig 8.1 Contract parties’ relationship and general responsibilities**
A building agreement is to be distinguished from a contract for the sale of goods. A contract for the sale of goods is not enforceable by action unless some note in writing of the contract is made and signed by the party to be charged. If the substance of the contract is the production of something to be sold, then that is a sale of goods. A contract simply to manufacture and supply a cabinet is a contract for the sale of goods. However, a contract not only to manufacture a cabinet but also to install it in a house in such a manner that it becomes a fixture, being a contract under which no property passes until the cabinet is installed, is a contract for work and labour and not a contract of sale.

A contract for the sale of goods is not enforceable unless expressly agreed and signed in writing – the obligations must be described in appropriate contractual documentation – whereas a building contract is enforceable by the terms of the contract, expressed or implied.

**Types of services**

**Design services**

Design and design-related services are often obtained from the building professional:
- architect
- engineer
- quantity surveyor.

This is done through a contract, often called a consultancy agreement or professional service contract.

These services may include the preparation of:
- drawings
- specifications
- conditions of contract
- bill of quantities.

These are designed to meet the client's requirements.

These agreements may also include the function of quality control during construction, certification and contract administration.

**Supply of goods**

Supply of goods without installation must have the supplier's obligations described in appropriate contractual documentation.

**Construction services**

There are a number of ways in which a construction project may be organised. The preparation of documents specifying obligations of parties, types of documents and who is to prepare them, and when, may depend on the contractual pattern.
Direct labour
The client (owner) may choose to carry out the project by employing their own labour force.

Traditional system
The traditional method of organisation for major construction work is for the client (owner) to contract with consultants to design and prepare the necessary documentation. Tenders are called, based on that documentation. The client/design consultant then selects a builder, who enters into a contract with the client to carry out the work described in the documents. The administration of the contract is then normally done on the client’s behalf by their agent, the design consultants.

This system should clearly define the function of all parties involved, but does take time, as each stage needs to be completed before the next can begin.

Design and construction
The client may require the builder to be responsible for the complete project, including the sketch design, design development, specification and construction to those plans and specifications. Those who favour this type of system claim it saves time, reduces costs and enables integration of design and construction. Others feel it may lead to a conflict of interests.

Problems can arise in establishing a price. For example, how does the client get value for money? Who determines the quality of construction? How does the client call tenders and select the successful builder?

Project management and construction management contracts
In the earlier types of construction contract, management of the project was not separated from design and construction or given an important role.

But there has been a growing need for effective overall management of construction projects, stemming from the increasing complexity of construction, a need for more controlled financial planning, a need to reduce design and construction periods and the increasing burden of effective administration of highly complex contracts.

Management contracting aims to apply management skills and techniques to the organisation and control of all aspects of the construction project and to optimise the use of resources to produce a well-designed and soundly constructed project which will meet the client’s requirements of function, cost, time and future maintenance. This has led to types of construction contracts called project management and construction management contracts. The terms used to identify these types of contract are not uniform. The obligations assumed by a project or construction manager may vary in proportion to their remuneration. But both systems supply a consultancy to the client in the same way that other specialist consultancies do.
Types of building contract

Lump-sum contract
The builder is to complete the works, in accordance with the documentation and within an agreed time, for an agreed sum. Lump-sum contracts can be of two types. The first is the fixed price or firm price contract, which has no provision for variation in price due to cost fluctuations. The second is a contract which is ‘subject to rise and fall’ – which does have such provision. Lump-sum contracts are most often favoured by clients, as they supply a fixed project price (apart from rise-and-fall provisions where included).

Lump-sum contracts may also be divided into those with and without a bill of quantities (Figure 8.2).

<table>
<thead>
<tr>
<th>A</th>
<th>Contract without bill of quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bill of quantities whose description and quantities are incorporated into the contract</td>
</tr>
<tr>
<td></td>
<td>forms basis of contract</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>B</th>
<th>Contract with bill of quantities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>bill of quantities not incorporated into contract (guaranteed B/Q)</td>
</tr>
<tr>
<td></td>
<td>for tender purposes only</td>
</tr>
</tbody>
</table>

Fig 8.2

Lump-sum contracts with a bill of quantities attempt to:
- reduce builders’ estimation risk
- provide fairer competition
- reduce tender costs
- provide feedback for both client and builder.

Schedule of rates contract
A schedule of rates contract is one whereby the cost of the work is calculated by applying an agreed schedule of rates to the work actually performed, which is measured. This is a useful form of contract where the extent of the works cannot be specified at the time of letting the contract. It is often used for piling, drainage works, street construction and other jobs involving extensive earthworks. The schedule will ordinarily give the contractor an estimate of the quantities of work involved; some knowledge of this is, of course, necessary for proper pricing.
A schedule of rates contract is sometimes confused with a particular kind of lump-sum contract – namely, the remeasurement contract, also known as the provisional lump-sum contract. A schedule of rates is a mere list of items and rates, quantities not being given; the cost of the work is calculated by applying the schedule to the quantity of work actually done. In the case of a remeasurement contract, or provisional lump-sum contract, a provisional bill of quantities is prepared, based on outline drawings. This is sometimes done in situations where the client is anxious to let a contract but the design is not sufficiently advanced to permit the preparation of anything more than a provisional bill of quantities. The contractor prices the provisional bill and submits a provisional tender. Work then proceeds and, either on the completion of the design by the architect/engineer or on completion of the works, the work is remeasured and the provisional sum is adjusted by the application of the rates in the provisional bill to the quantities as determined by the remeasurement.

The essential characteristic of a schedule of rates contract is that the contractor is to be paid at the agreed rates for the actual measured quantity of work once done; ordinarily the tender will contain a price, based on estimated quantities given in the schedule of rates, but this does not mean that the contract is a lump sum.

Cost-plus contract

The cost-plus contract is not used often. It takes two forms. By the first, the builder is entitled to be paid the cost of the work plus a commission in the form of a percentage of the cost; in the second, the builder is to be paid the cost plus a fixed fee. In drawing up a cost-plus contract, it is necessary to specify clearly what is meant by the cost of the work. The use of a cost-plus contract may be justifiable where pricing is extremely difficult, but clients normally avoid such contracts if possible. Whether the contract is for cost plus commission or cost plus fixed fee, the price of the work will not be known until the work is complete. A cost-plus-fee contract may include a provision for a bonus that increases, or a penalty that reduces, the fixed fee accordingly if the estimated cost of the work is not reached or is exceeded by the actual cost (including variations). It is then known as a target estimate contract. A contract whereby the builder is to receive the cost of the work together with a percentage of the cost to cover overhead and profit puts a premium on inefficiency; the greater the cost to the client, the greater the builder’s commission. And, while it may be possible to contend that on the proper construction of the contract the builder is not entitled to treat as part of the cost amounts spent by reason of their inefficiency, still such a contract puts the client in an unsatisfactory position. In a sense, fixed-fee contracts always contain a provision for a bonus or penalty. The fee being fixed, the percentage received by the builder will vary only in consequence of variations in the actual cost. A cost-plus contract may be negotiated with a selected builder. Alternatively, a number of builders may be invited to competitively quote a fixed fee or a percentage of cost as commission.

Reimbursement is normally calculated on a daywork basis:
- net material cost (invoice)
- plant hire (invoice)
- labour (time sheets)
- agreed mark-up – overheads
  - profit.
Nominated subcontract

This is a subcontract within the scope of the main contract for works of a specialised or semi-specialised nature.

The subcontractor is chosen (nominated) by the architect – hence the term *nominated subcontractor*.

Clearly, the builder must be in a position to control the nominated subcontractor, just as they can their own private subcontractors. This can only be achieved by having the nominated subcontractor bound by contract.

Therefore the parties to the nominated subcontract are the builder and the nominated subcontractor. Furthermore, the nominated subcontractor is bound to the builder under the same terms and conditions as the builder is bound to the client.

Legally, the builder is responsible for the work of the nominated subcontractor but, in the event of default or defective work, has greater redress in the matter of claims.

In addition to the nominated subcontract described above for labour and materials, there is, in most building contracts, provision for nominated supply of materials only, for example wall and floor tiles or sanitary fixtures. This nominee is designated a *nominated supplier*.

To summarise:

- A nominated subcontractor supplies labour and materials.
- A nominated supplier supplies materials only.

Provisional sums and prime cost sums

Nominated subcontract works form a part of the overall contract. It therefore becomes necessary to include approximate monetary allowances until such time as the subcontracts are let. At this time, of course, the monetary allowances will be omitted from the contract sum and the nominated subcontract amounts substituted.

A provisional sum can be defined as:

- a sum of money included in the contract for work which will be carried out by a nominated subcontractor.

A prime cost (PC) sum is defined in a similar manner:

- a sum of money included in the contract for materials which will be supplied by a nominated supplier.

The contract documents

The following comprise the typical contract documents.

1. Conditions of contract – define the contractual obligations of the parties with regard to the general management of the contract and deal with such things as completion date, payments, variations, disputes, retention and subcontracts. They should provide a sound, definite legal and administrative basis for the construction process.
2. The drawings.
3. The specification – describes, amplifies and supplements the drawings.

4. The bill of quantities – a schedule of the quantities of labour and material necessary to complete the work. Bills of quantities are not provided for minor contracts.

Contracts need control and this control is generally obtained through the conditions of contract mentioned above and these conditions should deal with some essential points.

**Some essential conditions of contracts**

The conditions of contract should provide the following essential rights:

- builder’s right of access to contract documents
- builder’s right to be given possession of site on a date agreed on or specified in the contract documents
- builder’s right to receive payment in accordance with the contract documents
- builder’s right not to be interrupted by the client during the course of the work
- builder’s right to have continuous possession of the site during the contract period
- builder’s right to be reimbursed for costs resulting from delays (where applicable) caused by the client
- builder’s right to be granted extension of time as a result of any default by the client
- builder’s right to vary contract sum as a result of variations in work or costs of labour and materials (where applicable)
- client’s right to have the building completed in the time, within the costs and of the quality stated in the contract documents
- client’s right to vary the scope of the contract work (where applicable)
- client’s right to inspect the work and open up for testing areas of suspicion
- client’s right to deduct liquidated damages from contract sum where the work is delayed due to the builder’s default
- both parties’ right to refer disputes to arbitration (where applicable) or litigation.
Forms of contract

The actual conditions of contract can take different forms. Forms of contract can be *private* – that is, produced for use by one client only – or *standard*, for use by people or companies in general construction.

Below is a table listing some of the different standard-form construction contracts and some points regarding their use. Also below is a list of industry organisations associated with various standard contracts.

MBA WA Master Builders Association of WA
MBA Master Builders Australia
HIA Housing Industry Association
AIA Australian Institute of Architects
PCA Property Council of Australia
NPWC National Public Works Committee
SA Standards Australia

### Standard contract forms

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<td>Publisher</td>
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<td>HIA</td>
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<td>MBA of WA</td>
<td>Gov’t of WA (DHW)</td>
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<td>Small-to medium-sized work</td>
<td>Housing projects</td>
<td>Small works</td>
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<td>Client’s agent</td>
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<td>Without architect</td>
<td>Without architect</td>
<td>Without architect</td>
<td>With superintendent</td>
<td>Without architect</td>
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<td>Without BOQ</td>
<td>Without BOQ</td>
<td>With/ without BOQ</td>
<td>Without BOQ</td>
</tr>
</tbody>
</table>
Chapter 9

Tendering

Introduction

Figure 9.1 shows the different areas which need to be considered for assessment of costs on individual projects when tendering.

![Diagram showing the different areas of costs in tendering]

Fig 9.1
As discussed previously, tendering can be subdivided into cases where a bill of quantities is provided and those where there is no bill of quantities (see Figure 9.2).

![Figure 9.2]

Measuring for each of these has already been discussed, so we will deal only with pricing here. The principles should be similar in both cases.

In the last chapter it was established that, for a contract to be valid, certain essential elements are necessary, one of which is ‘offer and acceptance’.

The calling for tenders is generally not regarded as an ‘offer’ but as an invitation for offers to be submitted by builders.

The tender price submitted to the client becomes the builder’s ‘offer’ to perform the work described in the tender documents (drawings, specification, bill of quantities where provided and conditions of contract) for the ‘consideration’ stipulated. It is then for the client to respond.

The builder’s offer must be current – that is, the tender documents generally stipulate a period for which the offer is to remain valid. At the end of that period, the offer cannot be accepted. Generally, it is possible for the offer to be withdrawn at any time before it is accepted. The builder must notify the client that they have revoked the offer. The client may also reject the builder’s offer. However, sometimes the rejection may come in the form of a counter offer which includes terms that differ from, or are in addition to, the terms contained in the original offer; it is then up to the builder to accept or reject the offer. For instance, a client intent on negotiation might reduce the content of the work and seek a lower price from the builder.
Before proceeding with the preparation of tenders, potential tenderers should realise that only one company can be successful and consider carefully the costs involved in preparation of a ‘bid’. Other items of consideration may also be time involved to produce an estimate (whether anyone is available with sufficient time) and the reliability of the client and documents. Not all documents and clients truly represent the actual work involved.

In order to encourage an orderly format and some ethics, various codes of tendering procedure have been established – for example, by the Commonwealth Government and Australian Institute of Architects. Instructions to tenderers based on such codes will be included in the tender documents.

**Competitive tendering for building works**

Federal and state governments and local authorities throughout Australia, in common with private industry, have precise requirements regarding certain aspects of the process of tendering. In the case of local governments, they are subject to statutory controls as to the procedures which can be employed when tenders are called.

The requirement for clearly defined procedures is borne of the need of organisations calling tenders to minimise the risk of legal action arising from the tendering process. Legal action may be mounted if a party or parties involved in a tender submission can show that the tender process gave unfair advantage to a rival party or parties. Unfair advantage may occur, for example, through unequal disclosure of relevant information among the tendering parties. Given that the conditions which apply to tendering are laid down by the organisation calling for tenders, a collateral contract could be said to exist between that organisation and those who choose to tender, insofar as an agreed course of action is being taken by tenderers – that is, following the specific instructions of the organisation. Should the organisation fail to observe the rules it set, it is possible that a collateral contract would have been breached. The costs of compiling a tender can be considerable – and there are legal precedents to indicate that courts may view with sympathy claims for compensation by tenderers disadvantaged by unfair or faulty procedure.

**Methods of invitation**

Tenders may be invited by various means, including the following.

- Public advertisement – advertising in newspapers and trade journals is the most common way of inviting interested parties to apply for tender documents. Advertisements stipulate the type of work, method of obtaining documents and a tender closing date.
  The statement ‘The lowest or any tender may not necessarily be accepted’ is usually inserted into the advertisement to allow for rejection of all tenders, for example if they exceed the budget price established by the architect.
• Pre-registration – this is usually achieved by advertising for ‘expressions of interest’. The advertisement would normally give an outline of the project, including location, value and allowed project period. Interested parties are required to demonstrate their capacity to carry out the works efficiently – by submitting details of their organisation, financial standing as verified by a bank and names of previous clients etc. This method identifies unsuitable applicants at an early stage, thereby simplifying the process.

• Private invitation – a list of suitable contractors is established and these are invited to tender for the works. Architects who specialise in the design and supervision of ‘non-standard’ projects, for example heritage projects, would seek builders who likewise specialise in such works. Similarly, for very large or complex projects, there may be relatively few building contractors judged as being capable of undertaking the works.

Good practice

The following are some basic procedures which, for good practice, should be followed by architects and others when calling for tenders.

• All of the information needed by a tenderer to produce properly prepared prices should be available at the time the invitation to tender is made.

• The method of delivery, place and time for submission of tenders should be made clear. These are usually prescribed in ‘information to tenderers’.

• The conditions contained in the tender documentation, which have been set by the organisation calling tenders, should be adhered to.

• Sufficient time should be allowed to enable tenderers to compile a realistic price for the works.

• All necessary approvals for the project by statutory and similar bodies should be in place before tenders are called.

• A project should not be the subject of more than one tender from any tenderer.

• A deposit equal to the cost of producing one set of tender documents may be imposed on each tenderer. This is to be refunded if the documents are returned in good order.

• Procedure during tender period:
  – Notwithstanding the general notion that all documentation should be complete at the time of calling tenders, there will be instances where full information is not available then. For example, the work of specialist consultants in connection with provisional sums and the like – incomplete at the time of going to tender – may be made available later upon completion.
  – Where there is a query from a tenderer, the response should be sent in writing to all tenderers, who should be instructed to provide an immediate written acknowledgement of receipt and their taking account of the information.
  – Alterations to tender documents are to be avoided if possible but, if unavoidable, should be made early in the process.
  – While it is unusual to extend the period allowed for submission of tenders, all tenderers must be informed of any such extension at the same time.
• Procedure at end of tender period:
  – Notwithstanding the strictness usually applied to the due date and time for submission, a policy should be pre-established for dealing with late tenders. Actions which can be taken are:
    ○ not to accept late tenders if hand-delivered.
    ○ return them unopened to the sender (if delivered by post), stating date and time of delivery on the returned package. This pre-supposes that the ‘post office rule’ does not apply – that is, if the tender was submitted by telegram or pre-paid post and can be proved to have been lodged at the post office before the closing time and date, it should be accepted.
    ○ pass late tender submissions, appropriately endorsed, to the client.
  – If the number of submissions is judged to be an inadequate response, the architect may seek instructions from the client whether to extend the tender period or abandon the current process and begin again at some other time, in which case the tenderers would receive back their tender documents (the bids) unopened.

• Procedure for opening of tenders should be made clear in ‘information to tenderers’. This should cover the precise time tenders will be opened, who will open them and who will witness the procedure, where the opening will take place and what information will be disclosed at the opening and to whom.

• Procedure after opening of tenders:
  – A validity period should have been stated in the ‘information to tenderers’. This is the period after closing when tenders are carefully examined.
  – Given it is normal practice for the lowest acceptable bid to be accepted, in the event of error in that tender, the tenderer may be given the opportunity to stand by their tender or to withdraw it. The tenderer cannot amend the bid at this stage.
  – If no tender proves acceptable, the architect may elect to negotiate with one builder – normally the lowest valid tenderer – to try to arrive at an acceptable tender. Negotiation should proceed with only one tenderer at a time.
  – The architect should give the client an analysis of all tenders received, including non-conforming ones, and recommend acceptance of one tender or rejection of all. They should not recommend an invalid tender. If it is decided to negotiate adjustments with a non-conforming bidder, the original tender process must be abandoned.
  – A contractual arrangement comes into existence at the moment a tenderer is informed that their tender has been accepted. Verbal acceptance should be confirmed in writing.
Tender preparation – general comments

Figure 9.1, at the beginning of this chapter, indicates the different areas of cost consideration and each of these will now be examined in detail. However, on occasions, there may be other factors to be taken into account, depending on prevailing circumstances. Furthermore, since costs are constantly changing, the charges, rates and other figures used in the basic example calculations on following pages can be regarded only as illustrative.

Generally speaking, in compiling a tender, the builder concentrates in the initial stage on the ‘total direct costs’. The ‘site overheads’ would be calculated next, with the ‘office overheads’ and ‘profit’ being added as a percentage by management during ‘tender adjudication’. This approach is normally used because:

- It is more convenient to add one percentage at the end than to apply the same percentage to each and every item throughout the tender.
- It is strategic for the builder to compile a net cost to themself and then decide what percentage to add. Also, it is most convenient to split estimates into the main areas as indicated by Figure 9.1; this also enables all actual costs during construction to be coded into the same estimate cost classifications. A comparison of actual costs to estimated costs can be made and provides feedback for job progress and future estimating. The above can be represented by a cumulative finance schedule as indicated in Figure 9.3.

Of course, when estimating direct costs, they are further subdivided into trades and work items within each trade; we can also have the same reporting features for each of these.
If subcontractors are used, quotes need to be obtained. Unfortunately, when tendering, it is a fact of life that subcontractors will be reluctant to give a firm price until tenders are due to close (for they do not wish to give a possible advantage to their competitors). This places the estimator in the impossible situation of having to assess quotations and assemble a tender within the twenty-four hour period prior to tenders closing. In order to overcome this situation, the estimator will treat the preparation of a tender as if the builder will do all the work; that is, they calculate the quantities and prices to what they think to be a reasonable subcontractor’s figure. When subcontractors’ quotations are received, the most suitable price is selected and an adjustment made to the figure previously ‘guessed or calculated’ by the estimator. This method of ‘plugging in’ figures has two functions:

- It evens out the work involved in tender preparation within the given timeframe.
- It enables the builder to establish some reasonable figures to which they can compare subcontractors’ prices.

The following is therefore relevant, whether subcontractors’ or builders’ own labour is used.

**Direct costs**

**Labour costs**

Labour costs generally cannot be determined with the same degree of exactness as most other elements and they represent one of the biggest elements of risk associated with the construction industry. Nevertheless, with careful analysis of job conditions and the keeping of adequate cost records on previous similar operations, reliable labour costs can be estimated.

The accumulation of accurate labour cost data by cost accounting procedures is closely guarded and constitutes one of the most valuable ‘trade secrets’ of a contracting organisation.

![Diagram](Fig9.4)

Figure 9.4 shows the breakdown of labour costs which will need to be considered.
**Labour constant**
This is the anticipated amount of labour, in time, required for a particular item of work. It is normally collected from careful analysis of previous projects. It is usually expressed in hours or parts of hours; for example, it takes one-and-one-half man hours to excavate one cubic metre of sand for trenches (trench excavation is 1.5 hrs/cubic metre).

**Labour quantities**
The quantity of work required for the item of work in question:

<table>
<thead>
<tr>
<th>Item of work</th>
<th>Quantity of work</th>
</tr>
</thead>
<tbody>
<tr>
<td>trench excavation</td>
<td>15 cubic metres</td>
</tr>
</tbody>
</table>

**Labour rates**
The builder will base his rates on use of ‘labour only’ subcontracts. The builder will obtain an all-inclusive rate for the item of work. It is normally expressed as some monetary value for each unit of work performed, for example:

- $'x'$ per cubic metre of sand excavated
- $'y'$ per linear metre of trench excavated.

It could also be expressed as a lump-sum amount for the total item of work in question. The subcontractor is then paid for the work performed.

**Material costs**
It is generally recognised that not all materials delivered to construction sites are used for the purpose for which they were ordered, and that builders frequently use more materials than for which they receive payment. These materials are either lost or are used in the building process in ways which are not recognised by estimators. This excess material is known as waste – and waste which has not been allowed for comes from profit. The estimator’s approach to waste is, therefore, important in terms of a project’s viability.

Figure 9.5 indicates the different items for consideration in establishing material prices.
Material costs

Material quantity  Material unit price  Material waste  Delivery and storage costs  Package costs  Consumable costs

Direct

Design  Rejection  Mishandling

Indirect

Too much ordered

Substitution  Production  Negligence  Criminal actions

Fig 9.5

Design  – material left as a result of off-cutting or having to purchase a particular size/amount because that is how it is sold (supplier’s invoice system)

Rejection  – quality control

Mishandling  – breakage

Substitution  – putting to a use other than intended by estimator (e.g. using facing bricks in a common brick wall situation)

Production  – construction technique different from that intended by estimator (e.g. running timber in different direction from that allowed by estimator)

Negligence  – mistakes in production or estimating, lack of adequate protection

Criminal actions  – theft or vandalism

In conclusion, the importance of the correct allowance for waste cannot be over-emphasised. It is normally allowed as a percentage added onto the material supply cost. Assessing this percentage can only come with experience and will depend on the individual company’s construction procedure.
Plant and scaffold costs

Plant costs are generally assessed by considering the following:

- mobilisation – costs to bring the item to the site and set it up in position ready for use
- cost recovery of plant or hire costs
- running and maintenance
- demobilisation – costs to dismantle the item and remove it from the site
- labour or operator costs.

The recovery cost of plant will be assessed as a ‘hire cost’ (ie dollars per day/week etc) as determined by the cost to hire it from a local company, or it can be assessed by what it costs to own plant. The following formula can be used to obtain some guide but it should be stressed that recovery costs for self-owned plant are difficult to establish and will depend on individual accounting practices within each company.

\[
\frac{IC - RV}{N} = a
\]

- \(IC\) = initial cost
- \(RV\) = residual value
- \(N\) = life
- \(a\) = annual depreciation

eg compressor = $15,000 with a life of, say, 5 years and a resale value of $3000

\[
\frac{15,000 - 3000}{5} = 2400/\text{year}
\]

The total cost to allow for the compressor can then be assessed as follows:

- mobilisation – delivery and off-loading = $100
- recovery – time required 6 months 6/12 x $2400 = $1200
- maintenance = $200
- running – fuel @ $3/day (say 120 days) = $360
- demobilisation = $100

\[\text{Total} = 1960\]

Subcontract costs

Whether subcontract prices are used depends largely on the individual construction company’s approach. Generally, it is now established that main contractors use as little of their labour as possible and make maximum use of individual specialist contractors (subcontractors). It is therefore necessary when tendering to obtain subcontractors’ quotes. This can be on a lump-sum basis (ie total price) or on a schedule or unit rate basis (ie cost per unit of work performed – eg dollars per square metre).
When builders (main contractors) use subcontract quotes, they must remember that the contract is still between them and the client.

Conditions of contracts have very clear and specific requirements regarding subcontracting and it is important to understand them. By way of example, the following two clauses are contained in the standard-form contract ABIC MW-2008.

**Subcontracting**

1. The contractor may subcontract any part of the works, but not the works as a whole. The contractor is liable for the necessary work done by its subcontractors.
2. The contractor must take responsibility for any acts and omissions of its suppliers and subcontractors in relation to the works.
3. The relevant provisions of this contract must be included in contracts the contractor makes with its suppliers or subcontractors. The contractor must fully inform all potential suppliers or subcontractors of the contractor’s relevant obligations under this contract.

**Assignment**

Neither of the parties may assign any rights under this contract, without obtaining the other’s consent. That consent may not be unreasonably withheld.

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**Basis for subletting**

Having determined the extent of work to be sublet, the builder must then decide the basis on which they require subcontractors to quote. The builder has two options:

1. an all-inclusive price for the work to be done
2. a unit rate (or rates). This would necessitate the builder themself measuring the work involved and applying the subcontractor’s rates, thus arriving at the overall cost. The question of ‘waste’ must be clearly resolved between builder and subcontractor at the time of agreeing the subcontract rate. (Is waste to be included in the builder’s quantities or the subcontractor’s rates?)
Which option will the builder adopt? It is not so much a matter of one method being superior to the other but, rather, which is more suited to the builder’s own tendering and subletting policies. It is fairly safe to say that most builders would operate on the basis of the first option – that is, lump-sum quotes from subcontractors for labour, or labour and materials, as the case may be, plus the builder’s own assessment of the materials they will be supplying.

When using subcontractors’ quotes, the builder must be careful to analyse what is, or more importantly what is not, included in the price. It is therefore the estimator’s job to determine, where necessary, an allowance in the estimate to cover any conditions or other items imposed by the subcontractor in their quotation. The estimator must remember that they are in a competitive tender situation and not to over-price the estimate when trying to pick up subcontracted items. They will need to negotiate with individual subcontractors on items to be considered, such as:

- hoisting
- scaffolding
- sheds
- site accommodation
- handling of material –
  - off transport
  - storage
- temporary services
- sales tax
- time for completion
- imported goods – supply of
- rise-and-fall provisions
- conforming with specification
- variations
- progress payments.

**Indirect costs**

**Site overheads (preliminaries)**

Preliminaries are those items of cost which will apply to a project as a whole and cannot be attributed to any one section or trade. They are often said to be the influencing factor in the success or failure of the estimate. The estimator when tendering gives consideration to each of the following items and prices those which they believe will be applicable to the project (ie inclusion is at their discretion).
Elements of Administration

Builder's administration requirements

- site control – foreman
  – refuse disposal
- existing services
- project signboard
- temporary services – electricity, water etc
- sheds
- site accommodation
- workers’ amenities
- transport
- plant and equipment
- programming of works – bar charts etc
- site meetings
- clearance of site – intermediate
  – final
- making good – to other trades
- employee accommodation
- employee fares and travelling
- employees – special site allowance etc

Contract conditions (allowances)

- type of contract
- rise and fall – applicable?
- progress payments – how often?
- completion – practical
  – final
  – liquidated damages
- security, retention
- insurances
- fees
- variations – procedures
- documents required
- defects liability period – maintenance

Monetary allowances

- provisional sum – profit
  – attendance
- prime cost sum
- provisional quantity
- contingency sum
Chapter 9

Preliminaries are then assessed on the basis of what is required and can generally be further categorised as:

- mobilisation costs
- on going costs
- demobilisation costs or
- a combination of these.

Eg site accommodation:

- progress payments – how often?
- mobilisation – bring to site and erect
- on going costs – weekly hire costs
- demobilisation – demobilise and remove from site.

Preliminary costs vary according to the size and type of work being performed. As a guide only, preliminaries will be around 10 per cent of the project cost (excluding monetary allowances).

Office expenses (business overheads)

The costs/expenses of any building company can be divided into operating and non-operating costs, namely:

- operating costs – hire of labour
  - supply of materials etc
  - subcontract costs
  \{ related to projects
- non-operating costs – general running costs, for example:
  - selling expenses – advertising
    - commission
    - salaries
    - vehicles
  - administration – general office
    - supervision
    - control
    - insurances
  - finance – interest
  - general equipment – small tools
    - vehicles
    - small plant.

Overheads will vary greatly depending on the size and structure of the company, the type of work performed and its method of operation etc.
Medium to large companies would assess their business overheads based on historical costs of previous periods, for example:

### Previous year

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total revenue</td>
<td>$1,000,000</td>
</tr>
<tr>
<td>Profit</td>
<td>$10,000</td>
</tr>
<tr>
<td>Operating costs</td>
<td>$900,000</td>
</tr>
<tr>
<td>Non-operating costs</td>
<td>$90,000</td>
</tr>
</tbody>
</table>

Proportion of non-operating costs to operating costs

$$\frac{90,000}{900,000} \times \frac{100}{1} = 10\%$$

So, when estimating a project, the overheads would be assessed as 10% of the project costs.

**Keeping track of overheads**

Once overheads have been estimated for the year, it is important to keep track of the actual overhead costs incurred, because, if actual costs are more than those estimated, the company will not be recovering the full amounts. For instance, if an estimate was $13,000 in overheads per house – based on five houses per year – and the company only built four, the full amount will not have been recovered ($13,000 \times 4 = $52,000, while $65,000 is needed for full recovery). It is therefore necessary to keep regular track of overheads and make any necessary adjustment for the remainder (see Figure 9.6).

![Diagram](image-url)
Assembling the tender

This is simply a matter of putting together the various components: the preliminaries, the subcontractors’ prices and the builder’s own work and materials. The builder will also include any prime cost or provisional sums nominated by the client or architect, with profit and attendance added to these for themself. This total will be a net contract price to which the builder will add overheads and profit to give the tender sum.

Assessment of profit and overheads

It is a fact that a selling price is not necessarily restricted to cost price plus a fair margin for profit. A vendor sells their goods for the maximum amount obtainable from the purchaser, irrespective of what they cost to manufacture. So it is with the builder.

It is a case of supply and demand. If supply exceeds demand, the client can expect a competitive price. Alternatively, if demand exceeds supply, the builder can anticipate a handsome profit.

It is therefore up to the individual builder to decide for themself the percentage they will add, depending upon the circumstances prevailing at the time. Remember that this percentage is added to the net cost and not item by item.

Conclusion

Tendering, like most other aspects of quantity surveying, is not an area in which specific instruction can be given. So much depends on the working arrangements, preferences and philosophies of the particular firm.

The foregoing has been more in the nature of possibilities, suggestions and guidelines. Those likely to be involved in tendering would be well advised to give careful consideration to what has been presented with a view to developing their own techniques in the light of their own business experience.

It is of vital importance that the tender price should incorporate everything and be correct. It is not an exaggeration to say that mistakes in tenders could result in bankruptcy.

With this in mind, several points should be made:

1. Check your calculations – not necessarily in detail, but run a rough check on the bulk quantities. Overlooking the skirting could be costly but not fatal. Forgetting to include the slab could end in disaster.
2. Keep a constant check on costs. The cost of brickwork in the contract just completed must influence brickwork rates and prices in the tender to follow.
3. Be on the alert for any increases in the cost of labour or materials. If the contract contains a rise-and-fall clause, the tender will obviously be based on prevailing costs. However, if there is no such clause, allowance will have to be made for all anticipated increased costs.
4. Never forget that the tender, once accepted, becomes the contract price and is binding on the builder.
Since the consequence of a successful tender is that you will enter into a contract to construct that project for those costs, it is important to consider the following before deciding to put your estimating expertise into practice.

- Only one tender can be successful.
- What will it cost to produce that estimate?
- How much time will it take to prepare that estimate?
- How reliable are the tender documents?
- What is the risk in doing the work, in terms of:
  - client
  - resources
  - market?

If you are happy with the above, then proceed.

If successful with your estimate, then, before signing the contract, check:

- the tender price
- the tender documents against the contract documents
- that conditions of contract appendices are the same as at tender
- validity period of tender offer.

**Calculation of unit rates – examples**

Price analysis is concerned with the component parts of a rate; that is, the amount and value of the various contents – labour, materials, profit etc.

We will, of course, be concerned here with analysing rates as they appear against the measured item in bills of quantities. Note that these rates are theoretical, because the labour content can never be accurately decided. While one person may perform a certain labour in 15 minutes, it may take someone else 18 minutes – and possibly a third person 12 minutes.

For this reason you should consider the following analyses as examples of what must be taken into account when building up a rate. Do not regard the calculated rates as accurate up-to-date prices.

Price analysis is in itself a detailed study. This course touches only briefly on the subject, considering just a few examples of the major items in a bill of quantities.

**Quantities and rates**

The tenderer must calculate their rate in accordance with what they are told in the description in the bill of quantities. That is why great care must be exercised by surveyors in the wording of descriptions.

If the surveyor has included waste in their quantities, the tenderer need not make any allowances in their rate – and of course the reverse applies. If the tenderer is required to allow for laps, they must be advised accordingly.
In other words, the price must be complete in all respects. In building up a rate, the following items must be considered – sometimes all of them have to be included and certainly some must always be included:

1. cost of materials at wharf or railway station or merchant’s yard or delivered to site
2. loading up and delivering to site
3. unloading and handling at site
4. unavoidable waste or shrinkage in usage
5. costs of preparatory labours
6. cost of labour, hoisting and fixing at site, including use of equipment
7. subcontract costs
8. overheads and profit.

### Excavation

When pricing excavation items in a bill of quantities, prices are to include provision for levelling bottoms, back filling, consolidating and disposing of surplus soil. All of these must be taken into account when calculating a unit rate.

**Data:**

- 1 m³ of sand when dug increases by approximately 10%, ie there is 1.1 m³ for disposal.
- Clay/gravel = 25% bulking.

It is generally assumed that the ratio of backfill to disposal of surplus is 33%:67%.

**Example:**

Consider the following trench excavation item contained in a bill of quantities:

*Excavation in trenches for strip footings, 0 to 1000 mm total depth, part backfill and cart away remainder*

A typical layout to the solution could be as follows:

<table>
<thead>
<tr>
<th>Qty Constant</th>
<th>Labour Hourly</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation/compaction</td>
<td>m³ × hrs/m³ × $/hr =</td>
</tr>
<tr>
<td>Backfill/compaction</td>
<td>m³ × × =</td>
</tr>
<tr>
<td>Cart away</td>
<td>m³ × × =</td>
</tr>
<tr>
<td>Spread/level</td>
<td>m³ × × =</td>
</tr>
</tbody>
</table>

Subtotal

| Overheads | % × Subtotal = |
| Profit | = |

Unit rate $______/m³

To be able to arrive at a unit rate then, we need to assess values for each labour constant. In practice they will vary from job to job, depending on the conditions.
Example:

Excavation in trenching for strip footings, 0 to 1000 mm total depth, part
backfill and cart away remainder $m^3$

<table>
<thead>
<tr>
<th></th>
<th>Qty</th>
<th>Labour constant</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>Excavation/compaction</td>
<td>1 m³</td>
<td>$1.5 \text{ hrs/m}^3 \times 17$</td>
<td>$25.50$</td>
</tr>
<tr>
<td>Backfill/compaction</td>
<td>$1/3 \times 1.1$ m³</td>
<td>$0.6 \times 17$</td>
<td>$3.74$</td>
</tr>
<tr>
<td>Cart away</td>
<td>$2/3 \times 1.1$ m³</td>
<td>$0.6 \times 17$</td>
<td>$7.48$</td>
</tr>
<tr>
<td>Spread/level</td>
<td>$2/3 \times 1.1$ m³</td>
<td>$0.75 \times 17$</td>
<td>$9.35$</td>
</tr>
</tbody>
</table>

Subtotal = $46.07$

Overheads

$12\frac{1}{2}\% \times 46.07$

Profit

$5\% \times 46.07$

Unit rate = $54.13/m^3$

Pre-mixed concrete

To compile a rate for pre-mixed concrete in strip footings is merely a matter of adding wheeling and placing to cost of concrete.

Example:

<table>
<thead>
<tr>
<th>Material</th>
<th>Qty</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>1 m³</td>
<td>$80 \times 1$</td>
</tr>
<tr>
<td>– Waste</td>
<td>2½%</td>
<td>$107.50 \times 1$</td>
</tr>
</tbody>
</table>

Labour

<table>
<thead>
<tr>
<th>Qty</th>
<th>Labour constant</th>
<th>Hourly rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>wheeling</td>
<td>$1 m³ \times 0.5 \times 17$</td>
<td>$8.50$</td>
</tr>
<tr>
<td>placing</td>
<td>$1 m³ \times 1 \times 17$</td>
<td>$17.00$</td>
</tr>
</tbody>
</table>

$107.50$

Overhead

$12\frac{1}{2}\% \times 107.50$

Profit

$5\% \times 107.50$

$126.30/m^3$
Formwork

When pricing formwork items in a bill of quantities, prices are to include provision for erection, dismantling, cleaning and consumables.

Formwork can also be re-used, so the cost of materials can be spread over three, four or five uses, as the case may be.

**Example:**
Consider the following formwork item contained in a bill of quantities:

*Class 4 formwork to soffit of suspended slab, strutted 2.0 to 3.0 m²*

To be able to arrive at a unit rate, it is necessary to establish the quantity of materials and labour constants.

**Formwork design**

```
  +-------------------+
  |                   |
  |                   |
  +-------------------+
```

10 m

6 m

**Method** – Standard tubular ‘A’ frames

- 1270 wide $\times$ 1520 high
- + 1140 high extension
- + 450 adjustable head
- = 3110 at 2200 centres
Layout of ‘A’ frames

<table>
<thead>
<tr>
<th>1270</th>
<th>Frames</th>
</tr>
</thead>
<tbody>
<tr>
<td>1270</td>
<td>Frames</td>
</tr>
<tr>
<td>1270</td>
<td>Frames</td>
</tr>
<tr>
<td>1270</td>
<td>Frames</td>
</tr>
<tr>
<td>1270</td>
<td>Frames</td>
</tr>
</tbody>
</table>

Time
- Erection and pour: 1 week
- Cure: 2 weeks
- Total: 3 weeks

Hire costs
- Frame: $0.60/wk
  - 1520 × 1270 = $0.60/wk
  - 1140 × 1270 = $0.55/wk
- Brace suitable both frames: $0.20/wk
- Base plate: $0.10/wk
- Adjustable ‘U’ head: $0.30/wk
- Jointing pin: $0.10/wk
- Bearers: $0.20/wk/m
- Joists: $0.15/wk/m

Purchase costs
- Formply: 19 mm thick – $15/m²
### B/Q item

*Class 4 formwork to soffit of suspended slab, strutted 2.0 to 3.0 m²*

<table>
<thead>
<tr>
<th>Materials</th>
<th>Qty</th>
<th>Weeks</th>
<th>Rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frame</td>
<td>18</td>
<td>× 3</td>
<td>$0.60</td>
<td>$32.40</td>
</tr>
<tr>
<td>Brace</td>
<td>2</td>
<td>× 30</td>
<td>$0.20</td>
<td>$36.00</td>
</tr>
<tr>
<td>Base plate</td>
<td>36</td>
<td>× 3</td>
<td>$0.10</td>
<td>$10.80</td>
</tr>
<tr>
<td>‘U’ plate</td>
<td>36</td>
<td>× 3</td>
<td>$0.30</td>
<td>$10.80</td>
</tr>
<tr>
<td>Pin</td>
<td>36</td>
<td>× 3</td>
<td>$0.10</td>
<td>$10.80</td>
</tr>
<tr>
<td>Bearer</td>
<td>39.6</td>
<td>× 3</td>
<td>$0.20</td>
<td>$23.76</td>
</tr>
<tr>
<td>Joints</td>
<td>165</td>
<td>× 3</td>
<td>$0.15</td>
<td>$74.25</td>
</tr>
<tr>
<td>Plywood</td>
<td>70</td>
<td>× $15</td>
<td>$210.00</td>
<td>$210.00</td>
</tr>
<tr>
<td>Loss and damage</td>
<td></td>
<td></td>
<td></td>
<td>$37.52</td>
</tr>
<tr>
<td>Plywood</td>
<td>70</td>
<td>× $15</td>
<td>$210.00</td>
<td>$210.00</td>
</tr>
<tr>
<td>(anticipated no. of uses = 5)</td>
<td></td>
<td></td>
<td></td>
<td>$210.00</td>
</tr>
<tr>
<td>Consumables</td>
<td></td>
<td></td>
<td></td>
<td>$23.00</td>
</tr>
<tr>
<td>Labour</td>
<td>70</td>
<td>× 15</td>
<td>$1155.00</td>
<td>$1155.00</td>
</tr>
<tr>
<td>(anticipated no. of uses = 5)</td>
<td></td>
<td></td>
<td></td>
<td>$1155.00</td>
</tr>
<tr>
<td>Overheads and profit 10%</td>
<td></td>
<td></td>
<td>$167.57</td>
<td>$167.57</td>
</tr>
<tr>
<td>Slab area 10 m × 6 m</td>
<td>$30.72/m²</td>
<td></td>
<td></td>
<td>$30.72/m²</td>
</tr>
</tbody>
</table>

Subtotal: $520.63

Total: $1843.20

Slab area 10 m × 6 m: $30.72/m²
Reinforcement

Reinforcement generally works on the basis of subcontracted supply costs from a specialist firm.

**Example:**
Consider the following contained in a bill of quantities:

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Materials</td>
<td>1 tonne</td>
<td>$650.00</td>
<td>$650.00</td>
</tr>
<tr>
<td>Laps (measured net) 5%</td>
<td></td>
<td></td>
<td>$ 32.50</td>
</tr>
<tr>
<td>Labour</td>
<td>1 tonne</td>
<td>9 hrs</td>
<td>$153.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>$17</td>
<td>835.50</td>
</tr>
<tr>
<td>Overheads and profit</td>
<td></td>
<td>10%</td>
<td>$ 83.55</td>
</tr>
<tr>
<td>per tonne</td>
<td></td>
<td></td>
<td>$919.05</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Brickwork

When pricing brick items in a bill of quantities, prices are to include provision for bricks, mortar, labour, plant and consumables.

Before compiling a rate for brickwork, it's necessary to first establish the cost of mortar. When mixing mortar, dry materials shrink by 25%.

**Data – mortar:**
- Cement = 25 bags per tonne, 1.5 tonnes per m$^3$
- Lime = 40 bags per tonne, 0.75 tonnes per m$^3$

**Example for compo mix 1:1:6**

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
<th>Rate</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cement</td>
<td>1 × 25 bags</td>
<td>1.5 t × $5/bag</td>
<td>$187.50</td>
</tr>
<tr>
<td>Lime</td>
<td>1 × 40 bags</td>
<td>0.75 t × $6/bag</td>
<td>180.00</td>
</tr>
<tr>
<td>Sand</td>
<td>6 × $10/m$^3</td>
<td></td>
<td>60.00</td>
</tr>
<tr>
<td>Materials</td>
<td>= 8 m$^3$ (dry)</td>
<td></td>
<td>$427.50</td>
</tr>
<tr>
<td></td>
<td>× 0.75 (shrinkage)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>= 6 m$^3$ (mixed)</td>
<td></td>
<td>$71.25/m^3$</td>
</tr>
</tbody>
</table>
Data – brickwork:

110-mm-thick standard brickwork requires approximately 0.4 m$^3$ of mortar per 1000 bricks.

230-mm-thick standard brickwork requires approximately 0.5 m$^3$ of mortar per 1000 bricks.

110-mm-thick standard brickwork will cover 20.4 m$^2$ area per 1000 bricks.

230-mm-thick standard brickwork will cover 10.2 m$^2$ area per 1000 bricks.

Example:
Consider the following contained in a bill of quantities:

\[
\text{Metric standard common brickwork in 110-mm-thick solid wall, built in compo mortar (1:1:6), GF to 1st F Level.} \quad \text{m}^2
\]

NOTE: The unit rate can be calculated by establishing individual costs per square metre or costs per 1000 bricks and then dividing by the equivalent number of square metres.
A typical layout for the solution could be as follows:

<table>
<thead>
<tr>
<th>Materials</th>
<th>Unit</th>
<th>Rate</th>
<th>Calculation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mortar</td>
<td>0.4 m³</td>
<td>71.25</td>
<td>$28.50 × 0.4 m³ × 71.25</td>
<td>$28.50</td>
</tr>
<tr>
<td>Bricks</td>
<td>1 Thou</td>
<td>250.00</td>
<td>$250.00 × 1 Thou × 250.00</td>
<td>$250.00</td>
</tr>
<tr>
<td>Delivery</td>
<td>1 Thou</td>
<td>25.00</td>
<td>$25.00 × 1 Thou × 25.00</td>
<td>$25.00</td>
</tr>
<tr>
<td>Subtotal material</td>
<td></td>
<td></td>
<td>$303.50</td>
<td>$303.50</td>
</tr>
<tr>
<td>Waste</td>
<td>2½%</td>
<td>303.50</td>
<td>$7.59 × 2½% × 303.50</td>
<td>$7.59</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>$311.09</td>
<td>$311.09</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Labour</th>
<th>Hrs/1000</th>
<th>$/hr</th>
<th>Calculation</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tradesperson</td>
<td>14 hrs</td>
<td>17.00</td>
<td>$238.00 × 14 hrs × 17.00</td>
<td>$238.00</td>
</tr>
<tr>
<td>Labourer</td>
<td>7 hrs</td>
<td>15.00</td>
<td>$105.00 × 7 hrs × 15.00</td>
<td>$105.00</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>$654.09</td>
<td>$654.09</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Plant</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Scaffold</td>
<td></td>
<td></td>
<td>Scaffold normally included in preliminaries</td>
<td></td>
</tr>
<tr>
<td>Mixer</td>
<td>7 hrs</td>
<td>2.00</td>
<td>$14.00 × 7 hrs × 2.00</td>
<td>$14.00</td>
</tr>
<tr>
<td>Subtotal</td>
<td></td>
<td></td>
<td>$668.09</td>
<td>$668.09</td>
</tr>
</tbody>
</table>

| Overheads       | 10%      |       | $668.09 × 10%                       | $66.81|
| Profit          | 5%       |       | $668.09 × 5%                        | $33.40|

\[
\text{Cost per m}^2 = \frac{\text{Total Cost}}{\text{Area}} = \frac{768.30}{20.4} = 37.66/m^2
\]

**Note:** Remember that this chapter has dealt with the theory of price analysis only to a limited degree. The calculated rates are not intended to constitute accurate, up-to-date prices.
Chapter 10

Variations and claims

Introduction

When building contracts are signed and come into existence, the builder should expect to be given the site on the date of possession and retain it until practical completion. Their obligation is to complete the work in accordance with the contract documents (drawings, specification and bill of quantities if applicable) and in return the client will pay the sum of money agreed in the contract. Along with these obligations, most conditions of contract allow other rights for both parties.

The builder has a duty to complete the works with materials and workmanship of such quality and standards as to be to the reasonable satisfaction of the architect (ie they are to take notice of instructions issued by the architect which cover compliance with contractual requirements – safety, workmanship, testing etc). The builder has a duty to adequately control the work to ensure that all work undertaken, including that which is sublet, is done satisfactorily. The builder is obliged to complete the works even if these prove to be far more costly than envisaged at the tender stage.

The architect has an obligation to supply the builder with all necessary information at the appropriate time and to administer all work contained in the project.

Most building contracts contain provisions reserving the right of the client, or their agent, the architect, to have the builder carry out variations to the scope of work and also prescribe a means by which such variations are to be valued – that is, a means of establishing the amount by which the original contract sum can be adjusted.

Figure 10.1 illustrates the overall contract process.
The common, but nevertheless critical, question as to whether certain work carried out by a builder is a variation is often a contentious issue and, in the first instance, it is necessary to precisely determine the extent of work that the builder has undertaken to perform under the original contract (ie work described in the specification and shown in the drawings).

This chapter, then, is concerned with the measurement of variations to a building contract that have been authorised in writing by the architect during the progress of the works.

The adjustment for a variation will normally involve one of the following:

- the measurement of extras where additional work is authorised
- the measurement of omissions where work is deleted from the contract
- the measurement of extras and omissions where a section of the work is changed in design
- the measurement of extras and the evaluation of demolitions where a variation is authorised subsequent to the completion of that section of the work involved in the change of design
- assessment of additional costs due to an extension of contract time certified by the architect

Fig 10.1
• monetary sum adjustment –
  ○ provisional sum
  ○ prime cost sum
  ○ contingency sum
  ○ contingent sum
• assessment of costs due to change to the terms of the contract.

The following are some useful guidelines for the determination of what are properly ‘extras’ within the meaning of a building contract:

1. An item specifically provided for in the contract is not an ‘extra’.
2. If the builder supplies material of a better quality than the minimum quality necessary for the fulfilment of the contract, without any instruction, expressed or implied, from the client to do so, they are not entitled to charge the extra cost as an ‘extra’.
3. If the builder does work or supplies materials not called for by the contract without instructions, expressed or implied, from the client or their agent, the builder is not entitled to charge for this additional work or materials as an ‘extra’.
4. If the builder does work or supplies materials not called for by the contract on instruction, expressed or implied, from the client, they are entitled to charge for such additional work or materials as an ‘extra’.

The above points need to be considered carefully, as a builder’s definition of a ‘variation’ is not always the same as that in the contract documents.

**Measurement of variations**

As in the preparation of bills of quantities, the observance of certain rules when measuring variations will not only simplify the task of the ‘taker-off’ but also considerably reduce the possibility of errors.

Consider the following:

1. In the situation where both additions and omissions are considered, it is generally better to measure all the omissions completely and then measure the additions. The policy of omitting one item and then adding its counterpart and so on can lead to confusion. Complete the ‘omits’ before starting the ‘adds’.
2. Don’t necessarily measure in trade order. Variations can often involve the measurement of numerous minor items and it is often preferable to take the items in logical order. It then becomes a simple matter to write them out again in trade order. A checklist can often be useful.
3. Great care should be taken to avoid confusion between ‘omit’ measurements and ‘add’ measurements.

   Consider, for instance, the situation where the client requires an additional window. Brickwork and plaster will be omitted for the length and height of the opening but plaster will be required to the reveals. So the variation will include two items of plaster, one in the omissions and a second in the additions.

   It is often wise to prefix every omission with the word ‘omit’ and every addition with ‘add’.
Chapter 10

Variations and claims

Valuation of variations

The assessment of variations can often involve the parties concerned in prolonged, and sometimes heated, discussions. To avoid this and to provide a basis for settlement, most conditions of contract contain a clause that deals with the valuation of variations. The clause usually applies to one of two situations:

- valuation of variation applying bill of quantities rates
- valuation of variations otherwise.

There are four situations which can apply:

1. If the work is of similar character and executed under similar conditions to work in the bill of quantities, the unit rate contained in the bill of quantities shall apply.

2. If the work is not of similar character and/or not executed under similar conditions to work in the bill of quantities, then, where reasonable, the valuation shall be based on the unit rate in the bill of quantities. (This is often referred to as ‘pro-rate’, meaning proportional.)

3. If the work cannot be related to any item in the bill of quantities, a fair valuation of labour, material, overheads and profit shall be agreed between architect and builder. It is often a requirement of the contract to have the valuation of the variation agreed before the actual work is done. However, this is not always possible.

4. If any of the above three methods cannot be agreed as a method of valuation, the architect may instruct the builder to proceed with work and valuation shall be on a ‘dayworks’ basis, ie:
   - the amount of wages and allowances paid by the builder
   - the actual cost to the builder at the site of all materials supplied and required for the work
   - the amount paid to subcontractors required for the work
   - the amount of hire costs in respect of constructional plant, scaffold etc
   - a percentage as stated in the contract conditions to cover preliminaries and overheads.

In cases where no agreement can be reached on the valuation of a variation, it is not uncommon in some forms of contract to give the architect the power to authorise the value of the variation and the contract sum can be adjusted accordingly. This would only be used as a last resort.
Variation example
The following two pages show how the variation described below would be valued (according to method no. 2 above).

Description
The external face of building to be salmon cream tumbled bricks with cut and struck joints in lieu of cream facings with rolled joints.

Height = 3 m
Openings:
– doors 3/900 × 2100
– windows 6/1800 × 1200
### Variations and Claims

#### Omissions

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Rate ($)</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cream facings as page 58 Item D, B/Q.</td>
<td>m²</td>
<td>247</td>
<td>$38.50</td>
<td>$9509.50</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2/30 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>2/15 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>90 000</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>8/½ = 110 ddt</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>87 560</td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.00</td>
<td></td>
<td>262.68</td>
<td></td>
</tr>
<tr>
<td>DEDUCT</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3/</td>
<td>0.90</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2/10</td>
<td>2.97</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>6/1.80</td>
<td>12.96</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>12.20</td>
<td>15.93</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>246.75</td>
<td></td>
</tr>
<tr>
<td>TOTAL OMISSION TO SUMMARY</td>
<td></td>
<td></td>
<td></td>
<td>$9509.50</td>
</tr>
</tbody>
</table>

#### Additions

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Unit</th>
<th>Quantity</th>
<th>Unit Rate ($)</th>
<th>Total ($)</th>
</tr>
</thead>
<tbody>
<tr>
<td>110 mm thick leaf of cavity wall built in salmon cream</td>
<td>m²</td>
<td>247</td>
<td>$42.86</td>
<td>$10,586.42</td>
</tr>
<tr>
<td>Facings with cut and struck joints, pro-rata</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Price analysis**

- **Unit rate in B/Q = $38.50**
- **Assume Overheads 9%**
- **Labour and materials = $35.32**
## Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cream bricks</td>
<td>$350/1000 = $350.00</td>
</tr>
<tr>
<td>Waste (5%)</td>
<td>17.50</td>
</tr>
<tr>
<td>Mortar (70/1000)</td>
<td>70.00</td>
</tr>
</tbody>
</table>

\[ \frac{\$350.00 + 17.50 + 70.00}{20.4\, \text{m}^2} = \$21.44/\text{m}^2 \]

## Labour

\[ \text{Labour} = \$35.32 \times 1.1 = \$39.32 \]

## Pro-rata rate

It is envisaged that labour will be approximately 10% more expensive.

## Materials

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>Salmon tumble brick</td>
<td>$400.00</td>
</tr>
<tr>
<td>Waste (5%)</td>
<td>20.00</td>
</tr>
<tr>
<td>Mortar (70/1000)</td>
<td>70.00</td>
</tr>
</tbody>
</table>

\[ \frac{\$400.00 + 20.00 + 70.00}{20.4\, \text{m}^2} = \$24.05/\text{m}^2 \]

\[ \text{Labour} = \$39.32 \times 1.1 = \$43.25 \]

## Overheads & Profit

\[ 9\% \times \$43.25 = \$3.89 \]

\[ \text{TOTAL ADDITION TO SUMMARY} = \$10,586.42 \]
Summary

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Omission</td>
<td>$9509.50</td>
</tr>
<tr>
<td>Additions</td>
<td>$10,586.42</td>
</tr>
<tr>
<td>Net addition</td>
<td>$1,076.92</td>
</tr>
<tr>
<td>Non-time-related preliminaries 10%</td>
<td>$107.69</td>
</tr>
<tr>
<td>Total net addition</td>
<td>$1,184.61</td>
</tr>
</tbody>
</table>

Errors in bills of quantities

Where a bill of quantities is included in the contract documents, the following will generally apply in the adjustment of errors:

Any error in the bill which results in an under-measurement in quantity will be treated as an extra and the value of the under-measurement added to the contract sum.

Conversely, any over-measurement in quantity will be treated as an omission and adjusted accordingly.

Although this ruling will apply only where the bill forms part of the contract, it must be emphasised that, almost without exception in Western Australia, the architect now classifies the bill of quantities as a contract document.

It should also be noted that the word ‘quantity’ shall include ‘descriptions’ of items in the bill of quantities.

Most conditions of contract will have a clause which relates to ‘errors in bill of quantities’ and how they are to be handled.

Monetary sums

Contingency sum

A sum of money is allocated pre-tender by the architect and included in the bill to cover any expenditure that may become necessary due to circumstances that were unforeseen at the planning stage. It is intended to provide for such things as:

- changes in design
- changes in the client’s requirements
- expenditure by the architect on the client’s behalf not previously envisaged.

Any of the contingency sum that has not been expended will be omitted from the contract sum at the completion of the works. The written authority of the architect is required for any expenditure by the builder.
Provisional item

When the extent of a particular item is not known, the item is measured in the normal manner using approximate dimensions and the word ‘PROVISIONAL’ is included at the end of the description. The tenderer then knows that the item will be re-measured accurately at the completion of the work and the necessary adjustment made to the contract sum. Examples are excavation in rock, and pile and keel to drain trenches – for instance, the following item:

*Excavation for footing trenches in limestone including to remove and clear away (PROVISIONAL).*

A series of provisional items is referred to as *provisional quantities*. On rare occasions when the project has to start with insufficient time for planning and detailing, a *provisional bill of quantities* is prepared and the entire contract is re-measured as the work proceeds.

The rates contained in the bill are used in the assessment of the re-measurement as the work proceeds.

Adjustment of provisional sums

Remember that a provisional sum is an approximate amount included in the bill of quantities for work to be carried out by a nominated subcontractor.

During the progress of the main contract, a nominated subcontractor will be appointed and, of course, their quotation or tender is bound to differ from the amount of the provisional sum. An adjustment will need to be made as follows:

Assume the provisional sum shown in the tender extract below to be contained in a bill of quantities:

- Provide the provisional sum of $100,000 for electrical services to be carried out by a firm to be appointed by the architects. $100,000
- Allow for profit (1½%) 1,500
- Allow for attendance (2½%) 2,500

It can be seen that the tenderer has priced the profit at 1½%, extending to $1,500. He has also priced the attendance at 2½%, extending to $2,500.

Suppose the nominated subcontractor’s accepted tender comes in at $110,000 and, during progress of the work, electrical extras are authorised to the extent of $5,000. The electrician’s final account would be valued at $115,000.

| Messrs Electrical Engineering Co quote | $110,000 |
| Add electrical extras | $ 5,000 |
| **Total of account** | **$115,000** |

It is obvious that three adjustments are required to the bill of quantities:

1. the provisional sum
2. the profit
3. the attendance.
In making the adjustments, it is strongly recommended that the same policy be adopted that was suggested for variations. That is, omit everything as a whole and add back the revised amounts complete.

The adjustment should be made as follows:

**OMIT**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Provisional sum as BQ</td>
<td>$100,000</td>
</tr>
<tr>
<td>Profit 1½% as BQ</td>
<td>$1,500</td>
</tr>
<tr>
<td>Attendance 2½% as BQ</td>
<td>$2,500</td>
</tr>
<tr>
<td><strong>Total omission</strong></td>
<td><strong>$104,000</strong></td>
</tr>
</tbody>
</table>

**ADD**

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Messrs Electrical Eng quote</td>
<td>$110,000</td>
</tr>
<tr>
<td>Add, extras</td>
<td>$5,000</td>
</tr>
<tr>
<td><strong>Total of account</strong></td>
<td><strong>115,000</strong></td>
</tr>
<tr>
<td>Profit 1½%</td>
<td>1,725</td>
</tr>
<tr>
<td>Attendance 2½%</td>
<td>2,875</td>
</tr>
<tr>
<td><strong>Total addition</strong></td>
<td><strong>$119,600</strong></td>
</tr>
</tbody>
</table>

Note the following:

1. $104,000 to be omitted from the contract sum.
2. $119,600 to be added to the contract sum.
3. $115,000 to be paid by the builder to the electrician.
4. 1½% tendered by the builder for profit and 2½% for attendance is applied to the total of the nominated subcontract. This principle applies whether the amount of the subcontract exceeds or is less than the provisional sum.

The percentages the builder inserts for profit and attendance are used in the adjustment. If the builder chooses not to price profit and attendance, then, of course, nothing is paid to them in the adjustment. Prime cost sums are adjusted in a similar way.
**Prime cost within a measured item**

On occasions, a prime cost sum is inserted into a measured item, as shown below.

\[
150 \times 150 \text{ mm glazed wall tiles} \\
\text{PC $18 per square metre and bed} \\
\text{and point in cement mortar (1–3) m}^2 \quad 100 \quad $28 \quad $2800
\]

This is an item of builder’s work, except that the architect reserves the right to choose the tiles at a later date.

The builder’s rate of $28 indicates that they have allowed $10 per square metre for labour and for profit and overheads.

Suppose the architect chooses tiles at $16 per square metre and because of extras the final quantity of tiles is 120 square metres. The adjustment should then be made as follows.

OMIT

\[
\begin{align*}
\text{Wall tiles as BQ} & = $28 \text{ (B/Q)} \\
\text{Supply and fix and profit} & = $18 \text{ (PC)} \\
\therefore \text{Fix and profit} & = $10
\end{align*}
\]

ADD

\[
\begin{align*}
\text{Supply only tiles} & = 120 \text{ sq. metres at $16} \quad $1920 \\
\text{Fix only tiles and profit} & = 120 \text{ sq. metres at $10} \quad $1200 \quad \text{total $3120}
\end{align*}
\]

In the adjustment of such an item, the builder’s labour and profit remain constant. Only the PC is adjusted and, of course, the quantity if it has varied.

**Purpose**

In summary, the purpose of monetary sums is to cover situations where:

- specialist work is involved
- the nature of the work is unknown
- the extent of the work is unknown
- unforeseen circumstances may arise
- the client requires some control in selection of the subcontractor/supplier or
- money is to be included in the budget for work to be decided in the future.
Definitions relating to conditions of contract

**Site instruction** – the architect’s instruction for the builder to comply with contractual requirements relating to safety and workmanship

**Variation order** – the architect’s instruction for the builder to comply with some item of work outside their original contractual requirements

**Contract duration** – the builder’s contractual time for completion, starting at ‘date for possession of site’. The actual date on which the builder takes possession is the ‘date of possession of site’.

**Practical completion** – the date certified by the architect on which the works are reasonably fit for use and occupation by the client, excluding minor items of repair etc.

**Final completion** – the date certified by the architect on which all work is complete, including defects liability work. The contract is discharged.

**Liquidated damages** – a pre-determined sum of money payable by the builder to the client (or deductible from the builder’s due balance) that is intended to recompense the client for loss suffered due to practical completion being later than the date required under the contract (including extensions granted)

**Defects liability period** – the period of time stated in the contract, beginning at practical completion, during which the builder is responsible for repairing all defective work which becomes evident and which is due to their non-compliance with the specification and/or drawings.
Claims

The construction industry covers a complex field of activity involving many operative skills and conditions which vary considerably from one project to another. Site and climatic conditions, market conditions, project characteristics and available resources are some of the variables, each of which can have a significant effect on the operation of a contract.

Most construction contracts make provision for these complexities and uncertainties by the inclusion of clauses permitting the builder to claim for loss or expense resulting from specific contingencies. The standard forms of contract attempt to clarify the contractual requirements and remove any ambiguities as far as possible. In the absence of these provisions, builders would have to provide in their tenders for many more uncertainties than they do now, which would result in a significant increase in tender figures. However, under the standard forms of contract, the client will have to meet the cost of such contingencies only if they arise and are duly verified.

The term *claim*, as used in this context, is a request by a builder for recompense for some loss or expense that they have suffered or an attempt to void requirement to pay liquidated damages. It is in this light that claims should be viewed by both sides of the industry. Frivolous claims by builders to reduce the effects of inefficiency or profit shortfall are unlikely to receive sympathetic consideration by the architect or client. It is often argued that the term *claim* should be used only in respect of fundamental breaches of the contract and that the remainder are contractual entitlements. A claim, to be successful, must be well prepared, based on the appropriate contract clauses and founded on facts that are clearly recorded, presented and provable.

Remember that the contract is between the client and the builder, who is to provide a building in accordance with drawings and specification. All this is to be done *without interference* from the client and *within the timeframe and conditions* agreed in the contract. In return the builder will be paid an agreed sum of money.

It is this area of *time* and *interference* that is the centre of most claims.

The time to complete a contract can be:
- extended
- compressed or
- delayed

due to work being:
- added
- omitted or
- delayed.

This is not something only available to builders. Claims are also available to clients.

The builder is entitled to possession of the site at the date stipulated in the contract and the possession under most contracts must be unhampered. However, it should not be assumed interference will always be caused by the client.
Chapter 10

Variations and claims

The client may be to blame for:

- variations in excess of what’s normally anticipated
- adverse physical conditions
- delays by other outside contractors employed by the client
- failure to supply materials as agreed
- failure to supply the necessary information
- failure to give possession of the site.

The builder may be to blame for:

- inefficiency
- negligence
- strikes.

A force majeure (unforeseeable extraordinary) event/circumstances may cause a delay. Examples are:

- strikes (if builder not to blame)
- weather
- acts of nature.

It should be remembered that builders are experts in their field and should be prepared to accept:

- average conditions
- seasonal changes in weather patterns
- foreseeable risks.

Also, different influences may be involved in an overall delay to contract completion. Therefore, it is necessary to ascertain factors and assess the effects of all items as a whole. Figure 10.2 shows this situation.
In summary, then, not all delay claims will involve costs claimable by the builder. Delays may be:

<table>
<thead>
<tr>
<th>Delay Type</th>
<th>Builder’s Responsibility</th>
<th>Force Majeure</th>
<th>Client’s Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>nil time entitled</td>
<td>nil cost claimable</td>
<td>time allowed</td>
</tr>
<tr>
<td>NB</td>
<td>nil cost claimable</td>
<td></td>
<td>loss and expense allowed.</td>
</tr>
<tr>
<td>EOT</td>
<td>extension of time for completion of contract is granted.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD</td>
<td>liquidated damages applied.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Fig 10.2**

Types of claim

**Contractual claims**

These are claims that are founded on specific clauses within the terms of the contract, for example time clauses, delay cost, liquidated damages etc.
Chapter 10 Variations and claims

Ex-contractual claims
These claims are not based on clauses within the terms of the contract but the basis will be circumstances that have arisen out of the project and have resulted in loss or expense to the builder. In general, these claims are unlikely to succeed, as there is no contractual obligation for payments and any payment would be an ex-gratia payment (‘act of grace’) out of the client’s appreciation for completion of the project. The basis of such claims might be late delivery of materials, strikes, the contractor suffering exceptional misfortune etc.

Common law claims
A common law claim is an action taken through the courts for damages for a breach of contract.

Contractual claims
Contractual claims are the most common of the three types and may be classed as either ‘negative’ or ‘positive’.

Negative claims
Negative claims are those where the builder seeks to avoid a payment, such as liquidated damages. A claim for liquidated damages is one made by a client against a builder for allegedly not completing the works within the agreed contract period (ie a breach of contract). In order to mitigate this claim, a counter claim is often submitted by the builder. Examples of the grounds for such claims are:

- force majeure – an act of God or other extraordinary happening beyond the control of the parties
- adverse conditions – conditions distinct from normal
- strikes or site lock-out
- delay with items supplied by client –
  - inefficiencies of nominated subcontractors
  - inefficiencies of other persons employed by client.

Positive claims
It is this type of claim that attracts most attention, as it may allow the builder to recover additional costs incurred by them. If successful, this can result in an addition to the contract sum and consequently more money being paid to the builder. Such claims result from the builder having or not having to do something because of some happening which is not part of the original agreement. Examples are:

- a variation to the original scope of work
- any direct loss or expense that is not reimbursable by virtue of the valuation of a variation
- any direct loss or expense resulting from disturbance of the regular progress of the works by –
  - the client
  - the architect
  - a nominated subcontractor
○ loss of productivity due to interference of the above
○ opening up for inspection works which subsequently prove to be in accordance with contract requirements
○ delay in giving possession of site.

Costs

For the builder to be granted an extension of time:

- Progress of the works must be delayed and the cause of the delay must be beyond the fault of the builder.
- The builder must have taken all reasonable steps to avoid the delay.
- The delay must have had an effect on the ‘critical path’ of the project.

If the above has occurred, the builder may also be entitled to reimbursement for loss and expenses which they have suffered. This is not always the case because, depending on the circumstances, the builder may be entitled to time only without costs (as stated previously).

Where it is decided that costs are involved, then it is often difficult to assess the costs but they can be assessed in the ways discussed below.

Due to variation

If a bill of quantities is part of the contract documentation and the valuation of the variation is based on rates in the bill which include ‘preliminaries’, the ‘delay costs’ are reimbursed through the bill of quantities rates and no additional costs are given.

However, if the bill of quantities rates do not contain the ‘preliminaries’ or if a bill of quantities is not applicable to the contract, the reimbursement is through an agreed percentage of the ‘time-related’ preliminaries as agreed in the appendix to the conditions of contract and, where applicable, bill of quantities.

It is often normal practice not to look at individual variations but to aggregate variations and examine the combined effect of them on the ‘critical path’. The above may not be true if the variation is substantial enough to stand on its own regarding effect on the ‘critical path’.

Other than variations

Builders’ claims embrace a wide range of matters and the following is a list of the main items from which builders can assess their costs:

- site overheads (time-related costs)
  - accommodation
  - equipment expressed as percentage of contract time
  - employees or calculated at dollars per day
  - scaffold
  - plant
Variations and claims

Chapter 10

- off-site costs
  - company overheads expressed as percentage of gross income and related to length of contract
- loss of profit
  - loss of earning capacity expressed as percentage of gross income and related to length of contract

Rule of thumb

Cost for each week of extension – contract value less contingency sums divided by original contract period in weeks and then multiplied by 0.15

Prolongation claims

However, it is often that work is not totally stopped but only prolonged – that is, the builder may be claiming loss of productivity.

In this circumstance, builders often attempt to claim costs based on what they should have earned over the period in question (from the construction program) minus what they actually earned from their progress payments received. The balance is then the loss. (Alternatively, they assess actual costs and then deduct progress payments received.)

It must be stressed that this approach is usually unsuccessful, as clients do not wish to pay for any inefficiency of builders which may have been included in this method and also it is very difficult to assess what part may be the client’s loss and what part is the builder’s fault. The assessment of prolongation claims is usually very subjective and it is of vital importance that builders can show good, solid documentation for cause and effect in such claims.

Preparation of claims

Claims are submitted principally to cover the extra cost and/or expense resulting from disruption of the work or prolongation of the contract. In either case, a large amount of supporting information is needed in order to prepare a sound and logical claim, as described earlier in this chapter. One useful approach is for the builder to require foremen to insert daily comments against a numbered list of topics to avoid significant omissions.

In compiling a claim, a builder may need to refer to any of the following documents/records:

1. correspondence (seems straightforward at first but can have important implications)
2. approved minutes of site meetings (can contain instructions, variations and additional requirements)
3. architect's instructions (could be the most important single item)
4. contract and working drawings and other contract documents (identify discrepancies and inconsistencies between them)
5. labour allocation sheets (showing location, tasks and standing time)
6. correspondence over claims from subcontractors and suppliers (may indicate additional requirements for main contractor or cause of delays)

7. site diary (must contain accurate and comprehensive entries and will often highlight problems)

8. daily weather reports

9. receipt of drawings schedule (identification of revisions to drawings as compared with those on which tender was based)

10. progress photographs, dated by the photographer (can show lack of progress and identify disruptions as basis for prolongation claims)

11. site level details (basis for earth quantities)

12. effect of other contracts (under auspices of client and can be disruptive)

13. photographs and report detailing condition of site at date of possession or order to start work (could show obstructions and only part of site available)

14. records showing time period between date of tender and date of possession or order to start work (could show delay at outset)

15. build-up of tender (particularly allocations for preliminaries, site and general overheads and profit)

16. extension of time claims and allowances certified by architect

17. materials schedule (quantities received and delivery dates)

18. invoice lists (additional costs under rise-and-fall clause, where appropriate)

19. plant records (show standing time and number of times brought to and from site)

20. scaffolding records (showing time in use and whether reassembly was necessary)

21. authorised daywork schedule (covering varied work which cannot be valued at billed rates)

22. programs and progress charts (showing contractor’s anticipated program and actual performance)

23. borehole logs (actual soil conditions may be different from those which the contractor could reasonably have anticipated)

24. work method statement (identify extent to which disruption has occurred and its effect)

25. variation data sheets (nature and effect of variations)

26. progress payments, certificates and payments (amounts and pattern of payments – cash flow aspect).

Hence, one of the main criteria in establishing the validity of a claim is good, accurate records. Probably the next most important step is to inform the architect and quantity surveyor, within the time period stipulated in the contract, that claim situations are arising. A major problem can be the confidentiality aspect of much of the cost information, which the builder probably guards jealously and some of which may be needed to satisfy the architect or quantity surveyor of the validity of the claim.

Every claim should be produced as if it were to become evidence in court (which it may do) and should be carefully detailed and presented, preferably in a bound cover. An untidy and carelessly prepared claim is unlikely to receive very serious consideration.
Chapter 10

Variations and claims

The claim could conveniently be broken down into the following logical sequence:

1. contract particulars – details of the site (as contained in the preliminaries) and details of the contract (as contained in the contract agreement and appendix)
2. claim particulars – a summary of the basis of the claim, stating all facts and details, together with full particulars of the specific contract clauses on which the claim is based
3. evaluation of the claim – a summary of the builder’s financial loss and/or expense
4. appendices – a section that collates all the back-up information for the claim and evaluation.

Summary

In preparing a claim, the first essentials are for the builder to determine the extent of their obligations under the contract and then to obtain details of the matters that hindered them or prevented them from executing the works. Again, accurate, well-kept records are essential.

Remember that delays and their outcomes can be any of the following:

<table>
<thead>
<tr>
<th>Responsibility</th>
<th>Type</th>
<th>Outcome</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>EOT</td>
<td>Costs</td>
</tr>
<tr>
<td>Builder’s</td>
<td>inefficiency</td>
<td>no</td>
</tr>
<tr>
<td></td>
<td>negligence</td>
<td>no</td>
</tr>
<tr>
<td>Force majeure</td>
<td>weather</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>strikes etc</td>
<td>no</td>
</tr>
<tr>
<td>Client’s</td>
<td>variation</td>
<td>yes</td>
</tr>
<tr>
<td></td>
<td>delay by other contractors</td>
<td></td>
</tr>
<tr>
<td></td>
<td>adverse conditions</td>
<td></td>
</tr>
<tr>
<td></td>
<td>possession of site</td>
<td></td>
</tr>
<tr>
<td></td>
<td>interference etc</td>
<td></td>
</tr>
</tbody>
</table>

Rise and fall

The final type of claim for contract sum adjustment which will be dealt with here is that of rise and fall.

A lump-sum contract may be a fixed-price contract, containing no provision for variation of the price as a result of fluctuations in costs, or a firm-price contract subject to rise and fall.

Clauses providing for the adjustment of the price as a result of alterations in costs, called rise-and-fall clauses, became prominent in times of high inflation in the 1970s. They have been uncommon in recent years of relatively low inflation. Although, as the name implies, these clauses provide not only for a rise in contract price where costs rise but also for a fall, the adjustment is almost invariably in an upward direction, the system having been devised to protect builders and subcontractors against rising costs during the period between tender and completion of the work.
Sometimes a rise-and-fall clause will operate throughout the contract. At other times, the parties agree that the price will remain firm until a certain date, after which the rise-and-fall clause will operate.

Rise-and-fall clauses are not confined to lump-sum contracts. They can also be used in ‘schedules of rates’ and ‘provisional contracts’.

The principle common to formulas used in rise-and-fall clauses is that, instead of the contract price being adjusted by reference to the builder’s actual cost variations, reference is to be made to a building index, usually one of the Australian Bureau of Statistics indices, movements of which are to be reflected by movements in the contract price.

Various formulas are available for use – but they are of two main types. In the first, a distinction is drawn between labour and materials and separate adjustments are made to the labour and materials components of the contract price. The second kind of formula, instead of employing both a labour index and a materials index, uses a single index and makes adjustments to the contract price as a whole.

An example of one of the most commonly used formulas is NCAP2 (National Cost Adjustment Provision edition 2) – which distinguishes between labour and materials components.

That formula is:

\[
\text{effective value} \times \frac{\text{proportional value} \times \text{current index no.} - \text{base index no.}}{\text{base index no.}}
\]

where:

- The proportional value is 0.55 for materials and 0.45 for labour (materials are regarded as 55% and labour 45% of the average contract sum).
- The base index no. is the index no. (for either materials or labour – depending on which component of the rise-and-fall claim is being calculated) applying 14 days before tenders closed or, in the absence of tendering, the date of the builder’s offer.
- The current index no. is the index no. applying to materials or labour (as the case may be) at the time of the progress claim.
Chapter 11

Interim certificates, dispute resolution and other quantity surveying functions

Interim certificates

Definition

Interim certificates are periodic payments made to the builder during the construction of the works. They are also referred to as *progress payments* or *progress certificates*. The frequency of the certificates depends upon the requirements of the particular contract, but is usually determined:

a) on a time basis (for example, one payment per month)

   or

b) on a value basis (say one payment per $50,000 of completed work)

   or

c) on a stage basis (payments as the project reaches certain stages of completion).

Basis for payment

The conditions of contract stipulate very clearly what is allowed to be included and also how progress payments will be calculated.

Normally, the way of preparing interim certificates is on a ‘gross value to date’ basis. That is, the TOTAL value of completed works and materials on site is assessed at the time of each certificate.

This total value to date, less the total of all payments previously made, is paid to the builder. Usually the gross value is subject to a deduction for ‘retention’. This will be explained later.

The reason for adopting this ‘gross value to date’ is fairly obvious. Consider a brick wall under construction. Each time the site is visited for valuation purposes, more of the work will have been completed.

Looking at the wall, it would be impossible to determine what portion had been built since the last valuation, unless notes had been made and records kept.

However, it would be an easy matter to measure the total square metres of wall completed to date at any given time.

It follows that it is logical to assess the value of all the trades in this manner, thus arriving at a total (gross) job value, from which will be deducted the sum of all monies previously paid.
Chapter 11 Interim certificates, dispute resolution and other quantity surveying functions

Items payable in a certificate

The following is an outline of a typical certificate, but it must be pointed out that certificates will vary depending on the conditions of contract.

**The gross value to date of:**

1. completed work, including that of nominated subcontractors
2. material delivered to the site but not fixed, including that of nominated suppliers
3. a proportion of the preliminary items
4. ‘extras’ completed
5. rise-and-fall adjustment, if applicable

**Less:**

1. retention
2. amount previously paid.

Progress certificates are always prepared on an approximate basis. Determining an exact amount to be paid would be a lengthy process and just not worth the time. The main thing to avoid is over-valuation.

Retention

Retention is a sum of money retained by the architect on the client’s behalf as a safeguard against default by the builder.

The retention fund is acquired gradually through deductions from the amounts due to the builder in certificates.

To deduct the total retention from the first payment could place a financial burden on the builder, so, to avoid this, the total of the fund is reached in progressive stages.

Percentage of estimated contract value retainable – limit of retention

The contract, therefore, must make two stipulations with regard to retention:

1. the total, or limit, of the retention funds, for example $20,000. This is termed the limit of retention fund.
2. the amount to be deducted from each certificate until the limit is reached. This amount is usually expressed as a percentage of the gross value of each certificate, for example 10 per cent. This is called the percentage of estimated contract value retainable.

Once the limit of the retention fund is reached, no further monies are kept back from the builder. It is often normal practice for 50 per cent of retention to be released at ‘practical completion’ and the balance on ‘final completion’ – however, this is determined by the conditions of contract.
Bank guarantee

The builder lodges with the architect a written statement to the effect that their bank will guarantee payment to the total amount contracted for retention in the event of default by the builder. Naturally, the statement must be issued by the bank, not the builder, and must guarantee payment directly to the architect or their client.

If the builder is successful in obtaining such a guarantee from the bank, then of course deductions for retention are not made from the interim certificates.

Safeguards against over-payment

It has already been noted that it is sufficient to prepare certificates on an approximate basis. In doing so, care must be taken that the amount of the contract sum plus authorised extras is not exceeded.

An overpayment is often not too critical. However, towards the end of the job, common sense dictates that, instead of ploughing methodically through the total of work that has been completed, it is much simpler to pay the contract sum less the value of work still to be done – that is, work backwards from the final contract amount.

Payment of builder’s work

Perhaps the easiest way to determine the value to date of the builder’s work is to divide the priced bill of quantities into convenient groups and pay the percentage value of work completed in that group.

Suppose a project contained seven suspended concrete floors, including the roof. These floors could form one group. If five of the floors were completed, then five-sevenths of the group value could be paid. It would also be fair to assume that five-sevenths of the beams would be complete. The reinforcement and formwork would require separate consideration since, of course, these items must be ahead of the concrete – possibly six-sevenths complete.

Grouping, of course, is only a suggestion. With experience, surveyors develop their own individual methods and preferences.

In any event, the builder or their surveyor has to prepare a claim which must be checked by a representative of the client. It is sound advice for the various parties concerned to meet at the start of a contract to discuss and reach agreement on the preparation and presentation of the progress certificates.

Materials on site

In some contracts, the builder is entitled to payment for unfixed materials on site, provided that they are adequately stored and protected and have not been ordered prematurely. Once the value of materials on site has been included in a certificate, they become the property of the client and may not be removed from the site.

Generally speaking, materials not on the site should not be included in a payment, no matter how bona fide the builder and supplier may be. Imagine the situation where payment is made for cupboards which are being stored at the manufacturer’s factory and the cupboards are stolen or destroyed by accidental fire, or the supplier or the builder becomes bankrupt.
Even supposing that the premises were insured, considerable delay to the contract could result, not to mention the worry and inconvenience that would be caused.

Sometimes, however, the rule has to be broken, as in the case of costly and delicate equipment which could be damaged at the site. In such a case, prior to making any payment:

1. Inspect the equipment to ascertain that it is, in all respects, satisfactory.
2. Ensure that the equipment has full insurance protection.
3. Prepare documentation to the effect that legal ownership passes to the client upon receipt of payment.

**Payment of preliminary items**

Preliminaries are usually paid on a proportionate basis. However, the builder will incur expenses for certain of the items at the beginning of the contract, for which they are entitled to full recompense in the first certificate (these are normally called *mobilisation* costs).

Below is an example of a typical priced summary sheet for the preliminaries section of a bill of quantities.

<table>
<thead>
<tr>
<th>Description</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insurance</td>
<td>$ 6,000</td>
</tr>
<tr>
<td>Foreman</td>
<td>10,000</td>
</tr>
<tr>
<td>Setting out</td>
<td>8,000</td>
</tr>
<tr>
<td>Authorities’ fees</td>
<td>1,000</td>
</tr>
<tr>
<td>Plant and equipment</td>
<td>1,500</td>
</tr>
<tr>
<td>Workmen’s change room</td>
<td>500</td>
</tr>
<tr>
<td>Contractor’s site office</td>
<td>1,000</td>
</tr>
<tr>
<td>Supervisor’s site office</td>
<td>1,200</td>
</tr>
<tr>
<td>Scaffolding</td>
<td>3,000</td>
</tr>
<tr>
<td>Temporary electrical services</td>
<td>250</td>
</tr>
<tr>
<td>Temporary water services</td>
<td>200</td>
</tr>
<tr>
<td>Telephones</td>
<td>500</td>
</tr>
<tr>
<td>Hoisting</td>
<td>1,000</td>
</tr>
<tr>
<td>Sign</td>
<td>200</td>
</tr>
<tr>
<td>Periodic cleaning of site</td>
<td>800</td>
</tr>
<tr>
<td>Contingencies</td>
<td>12,000</td>
</tr>
</tbody>
</table>

As discussed previously, preliminaries are categorised as:

– mobilisation costs
– ongoing costs or duration costs
– demobilisation costs.
Using the above list as an example, the approach to payment of preliminaries would be as follows:

1. The contingencies must first be deducted. Remember that the contingency sum is included for unforeseen circumstances and will be omitted from the contract sum unless expended by the architect.

2. The following items may require immediate expenditure by the builder and, as mobilisation costs, their value should be included in full in the first certificate:
   - insurances
   - fees
   - change room
   - contractor’s office
   - supervisor’s office
   - sign.

3. The balance of the items are ongoing costs and would be spread over the contract period.

Arrangement would be made for payment of preliminaries as shown below. Assume a total of 12 progress certificates.

<table>
<thead>
<tr>
<th>Total of preliminaires</th>
<th>$47,150</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less contingencies</td>
<td>$12,000</td>
</tr>
<tr>
<td></td>
<td>$35,150</td>
</tr>
<tr>
<td>Insurances</td>
<td>6,000</td>
</tr>
<tr>
<td>Fees</td>
<td>1,000</td>
</tr>
<tr>
<td>Change room</td>
<td>500</td>
</tr>
<tr>
<td>Contractor’s office</td>
<td>1,000</td>
</tr>
<tr>
<td>Supervisor’s office</td>
<td>1,200</td>
</tr>
<tr>
<td>Sign</td>
<td>200</td>
</tr>
<tr>
<td></td>
<td>9,900</td>
</tr>
<tr>
<td></td>
<td>$25,250</td>
</tr>
</tbody>
</table>

$25,250 is the balance to be spread over 12 payments. This equals $2,104 per payment.

Certificate No. 1

| 9,900 |
| 2,104 |
| Gross value to date | $12,004 |

Certificate No. 2

| 12,004 |
| 2,104  |
| Gross value to date | $14,108 |

Certificate No. 3

| 14,108 |
| 2,104  |
| $16,212 |
Typical progress certificates

A typical payment will now be prepared. All the facts and figures, names of specialists and suppliers, prices and rates are fictional, of course.

The illustration extends only to some sections of the builder’s work. Clearly in practice, all trades in which work has been completed would be included.

When a trade has been fully completed, it is a waste of time to enter all the details or groups. But the total trade value must be included in the calculations, because, once again, a gross value to date is being assessed. See excavation item in example below.

It should now be apparent that:
1. As building operations begin on any trade in the bill, the certificate will show a series of items or groups of items.
2. When work on a trade is nearly complete, the certificate will show the full value of the trade, less any items still not complete.
3. After completion of work on the trade, the certificate will show only the trade value. Each successive certificate will continue to show the trade value.

Example:

NOTE:
- The reference at the beginning of each item refers to a bill of quantities.
- The percentage refers to the percentage of work complete.

<table>
<thead>
<tr>
<th>METROPOLITAN INSURANCE TRUST</th>
<th>Certificate No. 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Siteworks</strong></td>
<td></td>
</tr>
<tr>
<td>A21 Site excavation</td>
<td>100%</td>
</tr>
<tr>
<td>A23–25 Herbicide</td>
<td>50%</td>
</tr>
<tr>
<td>A30–32 Anti-termite treatment</td>
<td>100%</td>
</tr>
<tr>
<td>A40–44 Gravel to roads</td>
<td>75%</td>
</tr>
<tr>
<td>Bitumen</td>
<td>10%</td>
</tr>
</tbody>
</table>

| Siteworks to Summary          | $10,976 |

<p>| Excavator                     |         |
| Trade completed in full       | to Summary | $15,265 |</p>
<table>
<thead>
<tr>
<th>Description</th>
<th>Percentage</th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concrete footings</td>
<td>90%</td>
<td>$4,900</td>
</tr>
<tr>
<td>Concrete ground floor slab</td>
<td>50%</td>
<td>$3,500</td>
</tr>
<tr>
<td>Concrete walls</td>
<td>10%</td>
<td>$970</td>
</tr>
<tr>
<td>Concrete beams and columns</td>
<td>10%</td>
<td>$468</td>
</tr>
<tr>
<td>Sundries</td>
<td>15%</td>
<td>$185</td>
</tr>
<tr>
<td>Formwork to first floor</td>
<td>100%</td>
<td>$2,123</td>
</tr>
<tr>
<td>Formwork to walls</td>
<td>10%</td>
<td>$815</td>
</tr>
<tr>
<td>Formwork to beams and columns</td>
<td>10%</td>
<td>$323</td>
</tr>
<tr>
<td>Reinforcement to footings</td>
<td>100%</td>
<td>$1,779</td>
</tr>
<tr>
<td>Reinforcement to ground floor slab</td>
<td>75%</td>
<td>$1,656</td>
</tr>
<tr>
<td>Reinforcement to walls</td>
<td>15%</td>
<td>$958</td>
</tr>
<tr>
<td>Reinforcement to beams and columns</td>
<td>10%</td>
<td>$298</td>
</tr>
<tr>
<td>Formwork to pipes and columns</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Concretor to Summary</td>
<td></td>
<td>$17,975</td>
</tr>
<tr>
<td>Common brickwork</td>
<td>5%</td>
<td>$685</td>
</tr>
<tr>
<td>Sundries</td>
<td>5%</td>
<td>$182</td>
</tr>
<tr>
<td>Facings</td>
<td>1%</td>
<td>$74</td>
</tr>
<tr>
<td>Sundries</td>
<td>1%</td>
<td>$53</td>
</tr>
<tr>
<td>DPC flashings etc.</td>
<td>5%</td>
<td>$98</td>
</tr>
<tr>
<td>Bricklayer to Summary</td>
<td></td>
<td>$1,092</td>
</tr>
<tr>
<td>Amount previously paid</td>
<td></td>
<td>$20,420</td>
</tr>
<tr>
<td>Certificate No. 6</td>
<td></td>
<td>$2,103</td>
</tr>
<tr>
<td>Preliminaries to Summary</td>
<td></td>
<td>$22,523</td>
</tr>
</tbody>
</table>

(Note: Refer to previous explanation regarding payment of preliminaries.)

<table>
<thead>
<tr>
<th>Description</th>
<th></th>
<th>Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>10,000 common bricks at $140 per 1000</td>
<td></td>
<td>$1,400</td>
</tr>
<tr>
<td>2500 facings at $160 per 1000</td>
<td></td>
<td>400</td>
</tr>
<tr>
<td>Sawn timber, say</td>
<td></td>
<td>325</td>
</tr>
<tr>
<td>Materials on site to Summary</td>
<td></td>
<td>$2,125</td>
</tr>
</tbody>
</table>
Chapter 11 Interim certificates, dispute resolution and other quantity surveying functions

Variations
Retaining wall $290
Store entrance porch 305
Additional reinforcement to foundations 209

Variations to Summary $804

(NOTE: The builder is entitled to have the value of variations included in certificates, provided that the actual work has been carried out. No action is necessary for omissions in the preparation of certificates. The items omitted are just not paid.)

Nominated subcontractors
Amount previously paid to all nominated subcontractors $9,872

Certificate No. 6

H59 Electrician Messrs Electrics Ltd $2,953
Profit & attendance as BOQ 2.5% 73
Air-conditioning Messrs Coolair Ltd 1,124
Profit & attendance as BOQ 2.5% 28

Nominated subcontractors to Summary $14,050

Nominated suppliers
Amount previously paid to all nominated suppliers $1,219

Certificate No. 6

C65 Concrete sunscreens, Messrs Pre-Mix Ltd 602
Profit & attendance as BOQ 30

K9 Quarry floor tiles, Messrs Crosswell 90
Profit & attendance not priced in BOQ

Nominated suppliers to Summary $1,941

(NOTE: Further explanation may be desirable. Suppose there were 20 nominated subcontractors and suppliers and they had all received previous payments in one or other of the first five certificates.

Because of the gross value to date basis, all the firms would have to be included in the certificate, whether they were receiving payment with Certificate No. 6 or not. The method adopted here makes this listing necessary. So, with each certificate, include the total money previously paid to ALL nominated subcontractors and suppliers and then list those firms receiving payment with the current certificate and the amount they are to receive.

Payment will only be made to nominated subcontractors and suppliers on the production of an invoice.)
METROPOLITAN INSURANCE TRUST

Messrs John Smith & Son

<table>
<thead>
<tr>
<th>Summary</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siteworks</td>
<td>$10,976</td>
</tr>
<tr>
<td>Excavator</td>
<td>15,265</td>
</tr>
<tr>
<td>Concretor</td>
<td>17,975</td>
</tr>
<tr>
<td>Bricklayer</td>
<td>1,092</td>
</tr>
<tr>
<td>Preliminaries</td>
<td>22,523</td>
</tr>
<tr>
<td>Materials on site</td>
<td>2,125</td>
</tr>
<tr>
<td>Variations</td>
<td>804</td>
</tr>
<tr>
<td><strong>Gross value of builder’s work to date</strong></td>
<td><strong>$70,760</strong></td>
</tr>
<tr>
<td>Nominated subcontractors</td>
<td>14,050</td>
</tr>
<tr>
<td>Nominated suppliers</td>
<td>1,941</td>
</tr>
<tr>
<td><strong>Gross value of contract to date</strong></td>
<td><strong>86,751</strong></td>
</tr>
<tr>
<td>Less retention – 10%</td>
<td>8,675</td>
</tr>
<tr>
<td></td>
<td>78,076</td>
</tr>
<tr>
<td>Less previously paid (Certs 1–5)</td>
<td>54,973</td>
</tr>
<tr>
<td><strong>Value of Certificate No. 6</strong></td>
<td><strong>$23,103</strong></td>
</tr>
</tbody>
</table>

You will notice from the summary in the above example that:

1. All calculations are to the nearest dollar.
2. The subtotal of builder’s work, in this case, $70,760, serves two purposes –
   a) it provides an indication of the progress of the works, and
   b) in later payments it will provide a check against the possibility of over-payment.
3. Retention is deducted FIRST. Amounts previously paid are deducted AFTER deducting the retention.
4. The amount to deduct from Certificate No. 7 will be $78,076.

Note that 10% of the gross value is deducted for retention. A common mistake among students is that they deduct 10% of the limit of the retention fund.

Ten per cent of the gross value is deducted until the maximum is reached and, from then onwards, the maximum is deducted from each certificate; if the maximum were not deducted from all future payments, this would have the effect of returning the retention fund to the builder. In the following example, suppose that the limit of the retention fund, as stated in the contract, is $25,000.

\[
\begin{align*}
\text{Gross value of contract to date} & \quad \text{}$285,213$
\\
\text{Less retention, maximum} & \quad \text{25,000}
\\
\text{Total} & \quad \text{260,213}
\end{align*}
\]

10% would be $28,521, which is in excess of the maximum.
Once the payment is compiled by the builder, it is forwarded to the architect for authorisation. Once authorised (negotiation may be required between builder and architect to agree on the work done), the architect will raise a progress certificate which they will send to the client, who is then required to make payment to the builder within the time period stipulated in the contract.

Where no bill of quantities is part of the contract documents, payments are assessed in the same manner, except that the percentage completed is based on the trade summary and not individual bill of quantity items as previously shown. Below is an example.

<table>
<thead>
<tr>
<th>Trade</th>
<th>Contract value</th>
<th>Percentage complete</th>
<th>Value to date</th>
</tr>
</thead>
<tbody>
<tr>
<td>Siteworks</td>
<td>$15,000</td>
<td>90</td>
<td>$13,500</td>
</tr>
<tr>
<td>Excavation</td>
<td>$10,000</td>
<td>50</td>
<td>5,000</td>
</tr>
<tr>
<td>Concrete works etc</td>
<td>$25,000</td>
<td>10</td>
<td>$2,500</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>$21,000</td>
</tr>
</tbody>
</table>

**The final account**

A brief mention was made in Chapter 1 of the final account. You should now be in a better position to realise that inevitably there will be extras, omissions and also adjustments to monetary sums, all of which will result in a revised contract sum.

The final account is a reconciliation sheet; it is a statement showing the financial position at the final completion of the contract.

As is recommended for variations (see Chapter 10) and the adjustment of provisional sums, we should first omit from the contract sum all the variables and then add back the actual costs.

In the following example, the sum due to the builder totals $1,457,334 – less, of course, the total of the progress certificates (money already paid).
Metropolitan Insurance Trust

FINAL ACCOUNT

Amount of tender $1,454,241

LESS

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Contingency</td>
<td>$25,999</td>
</tr>
<tr>
<td>Provisional sums</td>
<td>620,225</td>
</tr>
<tr>
<td>PC sums</td>
<td>10,650</td>
</tr>
<tr>
<td>Profit and attendance</td>
<td>15,506</td>
</tr>
<tr>
<td>Provisional quantities</td>
<td>1,200</td>
</tr>
<tr>
<td></td>
<td>= 673,580</td>
</tr>
<tr>
<td></td>
<td>deduct $780,661</td>
</tr>
</tbody>
</table>

ADD

<table>
<thead>
<tr>
<th>Item</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Variations less omissions</td>
<td>28,695</td>
</tr>
<tr>
<td>nominated subcontractors a/c</td>
<td>615,427</td>
</tr>
<tr>
<td>nominated suppliers a/c</td>
<td>8,304</td>
</tr>
<tr>
<td>Adjust profit and attendance</td>
<td>18,716</td>
</tr>
<tr>
<td>Percentage increase to preliminaries</td>
<td>2,508</td>
</tr>
<tr>
<td>Rise-and-fall adjustments</td>
<td>3,023</td>
</tr>
</tbody>
</table>

Amount of final account $1,457,334

The final certificate will then be revised and issued by the architect for final payment (final account amount less that previously paid) due to the builder by the client.

The builder is then discharged from their contractual obligations.
Dispute resolution

Disputes, by their nature, are non-productive – but are a fact of life. The level of effectiveness in avoiding or resolving them will have an impact on the productivity of a business. A dispute inevitably diverts the focus of attention from doing business to resolving the dispute. The obvious solution is to avoid disputes but, when they occur, they should be resolved in a way which is as inexpensive as possible and with minimal damage to each party.

General settlement options

Negotiation

Negotiation involves direct communication between parties to the dispute. Because it is private and personal, it should be as quick and informal as possible and therefore should incur minimal cost.

Expert determination

This process involves the appointment of an expert who is independent of any of the parties to the dispute. They will make a decision based on the facts and their expertise. If the parties agree beforehand, the expert’s decision can be binding upon the parties.

Mediation

A mediator helps the negotiation process by their presence, by presiding over the proceeding and by their understanding of negotiation techniques. Mediation is a relatively informal process where the parties are able to talk out their problems, addressing their comments to each other and through the mediator.

Arbitration

The majority of written building agreements contain arbitration clauses. Arbitration is a means by which, upon application, differences or disputes which arise between client and builder can be resolved. Most contracts also provide that arbitration is a condition precedent to the bringing of an action – that is, that there must have been a determination by an arbitrator before litigation can proceed.

The arbitrator is generally nominated by, and acceptable to, both parties and is expert in the matter under dispute. The arbitrator should also be a disinterested person – that is, not related to one of the parties, nor an employee or employer of one party, and also must not be legally incapable in any way.

In the event of any dispute, either party may give to the other notice in writing that they intend to proceed to arbitration. At the end of a stipulated ‘cooling off’ period, the party giving notice shall, if they still wish the dispute to be referred to arbitration, give the other notice in writing that it will be referred to arbitration and also deposit a predetermined sum with the relevant association or authority.

The parties are then required to agree upon and appoint either a single arbitrator or two-person panel.

During all this, the builder is still required to continue without delay to perform and execute the works. Also, when one party is being referred to arbitration by the other, it does not prevent any party from raising a further claim or a set-off or cross-claim.
The decision of the arbitrator is final and cannot be questioned or set aside unless it can be shown that:

- the arbitrator was an interested party
- the arbitrator was legally incapable
- only one side was heard or
- there was some fault of law in the procedure.

Failure to comply with the arbitrator’s decision on the dispute and costs is classed as ‘contempt of court’ and carries the same penalties as would apply in a proper court of law.

Arbitration is used as a means by which disputes or differences can be settled quickly (six to eight weeks is normal) by people considered to be expert on the issue in question; that is, it avoids the court system with its potential to become very involved in technical aspects of law and procedures rather than concentrating on technical aspects of construction and the problems associated with the project and those involved.

**Litigation**

This is the process of taking a dispute through the courts using the full legal process.

**Quantity surveying – other functions**

Quantity surveyors can be employed independently by clients to represent their needs or, alternatively, by builders to control financial cost requirements (see previous chapters).

**Cost planning procedures**

Cost planning is quite simply the process of designing to or within a pre-calculated cost, determined by the finances available. In other words, it is a means of proving or disproving whether a particular project can be realised within a proponent’s target budget.

Most building owners today are compelled to adopt tight control of all costs used in feasibility studies, if the intended revenue from buildings is to be achieved. Because building costs are a substantial part of any feasibility study, it follows that a logical process of establishing a target cost at the outset of any project, and the realisation of that same cost at completion, is essential if credibility is to be maintained.

Cost planning should not be seen negatively as a restrictive influence on the work of the designer but more as a positive, disciplinary process, where money is allocated to the various building elements or features so as to obtain a building within a predetermined budget.
Fig 11.1 Flow chart showing the role of cost planning in design

The different types of estimates which have been discussed previously are used and are slotted into the flow chart (Figure 11.1).
**Builder’s cost control**

Project control by a quantity surveyor employed by a builder is the control of the actual builder’s *construction* ‘costs’ and ‘time’, which are collected and compared to what was allowed in the estimate (budget). This enables a comparison to be produced (cost report) and consequently a prediction of costs to completion of the project. The use of computers has enabled close control of builders’ costs.
ELEMENTS OF ADMINISTRATION
DIPLoma OF BUILDING AND CONSTRUCTION
CPCCBC5003A, CPCCBC5010B, CPCCBC5002A, CPCCBC4013A

LEARNER’S GUIDE

DESCRIPTION
This resource provides an overview of what can be called the administrative aspects of building contracting.

It addresses the fundamental factor of building quantities and goes on to consider the associated activities of estimating and tendering. Also addressed are aspects of building contracts and contract administration, including variations and interim certificates.

This revised text provides information particularly pertinent to a range of common managerial functions in that section of the industry engaged in commercial/industrial projects. As such, it is especially suitable for use in a number of units in the Diploma of Building and Construction (Building) (Builder’s Registration) course and other courses of similar academic standard.

COURSE/QUALIFICATION
Diploma of Building and Construction (Building) (Builder’s Registration)

UNITS OF COMPETENCY
• CPCCBC5003A (State code W9290) – Supervise the planning of on-site medium-rise building or construction work
• CPCCBC5010B (W9297) – Manage construction work

It is also a recommended text for the following Diploma units:
• CPCCBC5002A (W9289) – Monitor costing systems on medium-rise building and construction projects
• CPCCBC4013A (W9250) – Prepare and evaluate tender documentation.