COST PLANNING CIBC6035 2017

APPROXIMATE QUANTITIES

MEASURING REQUIREMENTS

Quantity surveying estimates need to fulfil these requirements:

1. Quickness in preparation,
2. Accuracy, and
3. Capability of adjustment for design changes and so on.

You must bear these requirements in mind when determining the way in which quantities will be measured for the estimate. Measurement in detail in accordance with NZS 4202 would fulfil the requirements of points 2 and 3 but would go completely against point 1. In any case, the estimate drawings would be little more than sketches, and detailed quantities would be out of the question.

Despite these problems, a reasonable method of measurement must be established. We need to establish quantities to give us accuracy and to enable us to adjust them for possible design changes. They must also be quick to prepare. Obviously, they must be less detailed than NZS 4202 requirements, but they must not be so coarse that the accuracy of the estimate is impaired.

You may think that items of such measurement should be set from a pricing viewpoint, but this is not entirely correct. The rates used for estimating are determined by analysing priced schedules of quantities, and this analysis need not reflect pricing requirements. Work items can be established, such as concrete in columns, and units of measure laid down. All-inclusive rates can then be established for the items by analysing priced schedules. The rate for concrete columns would include concrete, formwork, reinforcing steel, and all sundry connected work.

Analysis of the cost of columns from priced schedules would indicate how variable the total price was between jobs of similar or differing types, and a lack of excessive variation would indicate that the selected item of measure is acceptable.

That metres run or metres cube are reasonable units for columns for estimating purposes can be established from a pricing viewpoint, but as a quantity surveyor, you are not estimating the cost of the work. You are estimating the likely tender that will be received for the job. Thus, you are predicting tender figures, and to do so, you greatly rely on information from priced schedules that you have access to.

This is the whole difference between quantity surveying estimates and builder's estimates (pricing). Quantity surveyors are trying to predict the contractor's tender, but contractors are trying to forecast what the project will actually cost them to build.

By reasoned selection and analysis of priced schedules, you get items and units of measurement that are abbreviated in measurement terms but have a reasonable uniformity of all-up price between similar building types or even across building types. It is the uniformity of all-up price that is the basis of producing accurate estimates.

Such abbreviated measuring techniques are referred to as the measuring of bulk quantities. Fortunately, we do not have to set up a list of bulk quantity units for ourselves because the *Elemental Analysis of Costs of Building Projects* provides us with these.

This course is not just concerned with the elemental format but with the measuring detail for estimates. This detail can be used to produce estimates in elemental, trade-by-trade, or any other format required.

The information we need from the elemental analysis booklet are the sub-element units. If we refer to these simply as units of measurement for estimates, we can see that the thought of them applying to an elemental format alone is quickly dispelled. They can be used in any format.

Look at Element 3 in the booklet, and study the sub-elements 3.1 to 3.13 and the sub-element unit (unit of measure). All information given before the sub-elements applies *only* to the elemental format, and you should not become involved with this at this stage.

Your perusal of the sub-elements would quickly indicate that they are basically a statement of work function, that is, columns and beams and so on, together with their unit of measure.

What you must realise is that the unit of measure sets the measuring detail and no further detail is necessary.

All detail beyond the single unit of measurement is included in and accounted for by the rate applied to it for the estimate. In other words, the measuring detail in a schedule of quantities is transferred to and incorporated in the rates for estimating purposes.

This transfer of detail is achieved by analysing priced schedule of quantities, as we saw earlier. However, when a few analyses have been done to see the effects of the various factors on the all-inclusive rate, it is possible to use current unit rates to build up all-inclusive rates.

The use of current unit rates sometimes leads to a differing unit of measure than that laid down in the elemental analysis booklet. An example of this would be internal doors, Element 11. This calls for doors to be measured in square metres, but unit rates for such items are always on an enumerated basis. For this reason, it is usual for doors to be enumerated.

These odd conflicts are bound to occur, because analyses of priced schedules and analysis of unit rating can each be viewed as having differing purposes.

Physical analyses

So far, we have dealt with the analysis of prices in a schedule of quantities to provide rates for estimating purposes. There are instances, however, where analysis of physical data (quantity instead of value) is more important for estimating purposes than the analysis of prices. This will impact on the measuring requirements for the estimate.

Let us look at Element 3, sub-elements 3.4, steel in columns and beams, and 3.8, steel trusses. The unit of measure for these sub-elements is kilograms. As we have seen, estimate drawings are often no more than sketches, and the likelihood of having steel details is remote. You would therefore not be in a position to measure the steelwork in any detail, other than length.

To overcome this problem, a physical analysis of the steelwork is made and this can be used to estimate similar works. For example, the total weight in steel trusses can be divided by the floor area to give a mass per square metre of floor area. The mass of the trusses in the building being estimated is thus established by multiplying its floor area by the kg/m^2 factor previously established.

This physical analysis for estimating purposes can be used in several areas of work, and you will appreciate the change in the measurements required to apply it.

The physical analysis of work is very important for the rating of bulk quantities, but the rating is outside the scope of this course.

Measurement of estimating quantities

In looking at the measurement of quantities for estimates, we shall stick strictly to the elemental format set out in the analysis booklet, which is the format required for this course. This will ensure that you, your tutor, and the examiner are all looking at the same items within any given work section.

One thing must be stressed about the practical application of the work. As stated earlier, there are valid reasons for measuring some work in different units from those stated in the booklet. Also, the placement of particular items in the elements is not always clear cut, and this does lead to some differences in position of items. These points indicate that a person measuring for estimates must be aware of the office practice to ensure the work is measured to the estimator's requirements. This is simply a natural consequence of using bulk quantities and of applying an elemental split-up to the many varied designs of building encountered.

Before looking at the detail of the measuring, you must look at some basic estimating principles, so that you do not get into measuring bulk quantities when these are not required. Under the elemental estimating system, you have three distinct levels of estimating:

1. Unit cost of element
2. Element unit rate
3. Sub-element unit rate

* Turn to page 2 of the element analysis booklet and read the definition of these terms.

You will see that the sub-element unit rate is the only one that applies to what we refer to as bulk quantities. The other two are set against different measuring bases. The unit cost of element is applied to the gross floor area of the building, whereas the element unit rate is applied to the quantity of the element unit.

To give a better picture of how these three levels work, let us look at Element 12, Floor Finishes. Say we have the floor coverings of a recent building analysed in accordance with the elemental analysis. We can use the analysed rates to estimate the floor coverings on other buildings as stated below.

1. If the floor coverings in the building being estimated have the same specification level, the same mixture of coverings and the same percentage of floor coverings to gross floor area, we can use the unit cost of element rate to estimate their total cost. The gross floor area only is required to achieve the cost estimate and any more detailed measure will not improve its accuracy.

2. If the floor coverings in the building being estimated have the same specification level and the same mixture of coverings but the percentage of floor coverings to gross floor area is different, we can use the element unit rate to estimate their total cost. The actual area of all floor coverings (irrespective of type) is required in this instance.

3. If the floor coverings in the building being estimated have no commonality of specification level and mixture, we are forced to measure the area of each type of floor covering and use sub-element unit rates to calculate their total cost.

The explanations given above may appear to make the measuring of floor coverings for estimates very straightforward, but this is not really so. The level of detail provided in the estimate drawings, and any specification notes, will also impact on the estimate measuring. The detail may be insufficient to produce bulk quantities for the floor coverings, and a less detailed approach may have to be used. Only the estimator can decide what measurements to use in these circumstances.

You will realise from these comments that the practical measuring for estimates requires you to be flexible and to have a reasonable understanding of estimating procedures if you really are to come to grips with it. The alternative is simply to follow the instructions of the estimator without knowing the reasons for doing so.

Let us now look at some of the detail in measuring bulk quantities. The concept of splitting up quantities according to their physical position is generally ignored, the only split-up coming from elemental or estimate rating demands. For example, concrete columns from Element 3 would have one quantity covering all columns, no matter how many stories the building is. Diminishing sizes of columns would be accounted for in the dimensions, and the rate would be adjusted to take care of cost variations caused by size differences.

One particular area in the measuring can cause concern unless there is complete understanding between the estimator and the measurer. This is the question of net measurement. The rates revealed by analysis of priced schedule of quantities are for net quantities as laid down by NZS 4202.

The measurement of bulk quantities for estimates is, however, seldom completely net.

The measurement of the bulk quantities is mainly done by scaling off sketch drawings, and cross-sectional sizes are often set by the estimator or measurer from experience of past similar buildings. You cannot, therefore, clearly establish absolute accuracy in measurement. The accuracy obtained comes from the knowledge and experience of the measurer or estimator in dealing with like works.

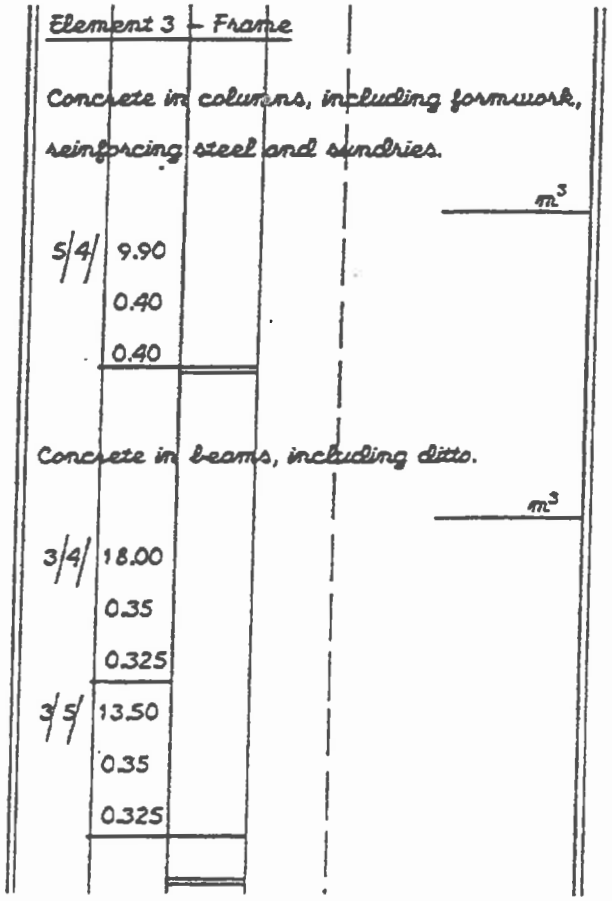
With this in mind, how far do we go in trying to make the quantities net in the terms of NZS 4202? Without doubt, the concept of estimating quantities does not equate with that of net detailed quantities.

The speed with which estimate quantities are prepared means that measurements should be kept to the simplest form possible, free of small adjustment dimensions which slow down their preparation and may lead to calculating errors. This lies against the principle of true net measure but it does not mean that the two sets of measurements cannot be compatible. Indeed, they must be compatible because estimate quantities must reflect the net quantities if the estimate figure is to be accurate against the tender figure.

It is through the rates that the two sets of measurement become compatible. The estimator will be aware of the differences in measuring detail and will make any necessary adjustments to the rates to allow for it.

As a general rule, the difference between bulk and net quantities will not be great, but they tend to be variable in percentage terms, and the experience of the estimator is important in making the due allowance.

Look for the simplicity of dimensions and the way in which small net measurement adjustments are ignored in the two following examples of bulk quantity measurements for sub-elements 3.1 and 3.2 under Element 3. The quantities are for a three-storey reinforced concrete structure.



Columns measured full height and no deduction made for slabs.

Beams measured overall length and no deduction made for column intersections.

REMEMBER

Measuring for estimates requires you to be quick and accurate.

Bulk quantities provide the means to achieve this.

In using bulk quantities, the measuring detail is transferred to rating detail.

PRACTICE EXERCISE A

1. Why does quantity surveying estimating differ from builders estimating?

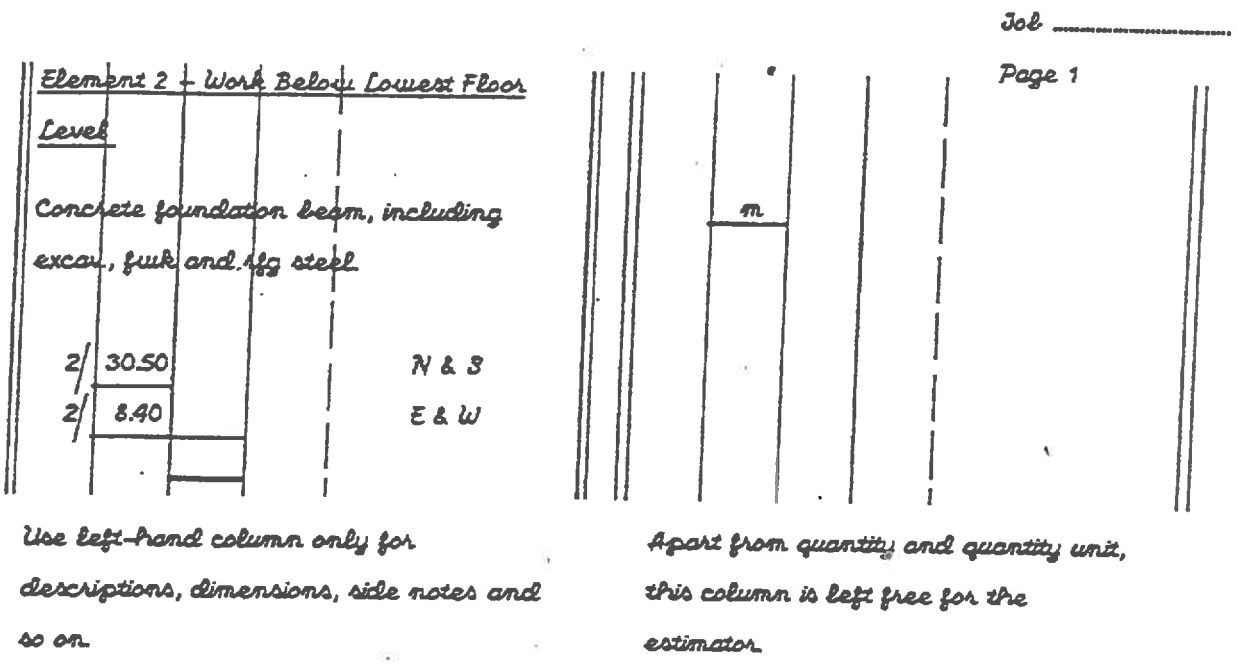
2. What are sub-element units?

3. What are the three levels of estimating under the element analysis booklet and what is their measurement base?

PRESENTATION OF TAKE-OFF

The take-off presentation for estimate quantities varies from normal take-off work in that room must be left to enter and extend the estimate rates. This means that the items and dimensions are entered on the left-hand side of the page, the right-hand side being needed for the estimate figures. Some offices will have specially ruled paper for the work, but you can easily use normal take-off paper.

A typical take-off follows, presented on normal take-off paper.



Note the following.

1. Enter job name on each sheet.

2. Page number the sheets consecutively.

3. Give the element number and name.

4. Fill out the description so that the coverage of the item is clear to the estimator. This is absolutely necessary in examinations to show the examiner that you fully understand bulk quantity work. The use of abbreviations in the description is acceptable providing their meaning is clear.

5. Dimensions are set out as for detailed take-off work. The use of side notes is important for checking and adjustment purposes.

Take-off procedure

The take-off procedure involves the measuring of work within each element as laid down in the elemental analysis booklet. Measure one element complete before moving on to another. The elemental split-up automatically lends itself to this approach. In all matters of consistency of approach, completion of dimension sets, and the like, work in the same way as in detailed measuring.

The main problem you will meet in the work is that of lack of detail in the drawings. Estimate drawings can vary from little more than outline sketches to drawings giving quite a lot of detail. Irrespective of the amount of detail, you must produce reliable quantities from the drawings. You must, therefore

1. Have a sound knowledge of what to expect in the building type you are measuring, and

2. Know when to ask a question about the requirements where these can affect the estimate.

You will realise that knowledge and experience are essential requirements in meeting the above demands. Nevertheless, in an examination, you will be judged on your performance in such matters. We cannot provide the knowledge and experience through these assignments but we can give an insight into the general concepts involved.

In detailed measuring, you simply measure the sizes, details and specification levels provided to you. In doing this, you gain knowledge of general requirements for buildings of differing types. You also gain experience of factors that can vary in buildings of a similar type. Your knowledge of other similar buildings to the one being estimated permits you to measure detail that may not be specifically shown on the sketch drawings. Likewise, you can impose specification levels suitable to the project if this proves necessary. Your experience in recognising factors that may vary will prompt you to ask questions where appropriate.

Even this does not explain the full position. The estimate drawings are not the sole source of information or detail on a particular proposed building. Knowledge of an architect's or engineer's detailing from working on their past contracts will normally be very helpful in estimating any of their future works. Measuring estimate quantities for an architect or engineer with whom you have had no previous contact will leave you with many areas where you will need to find out what they envisage as the detailing.

This reasoning leads us to take a flexible and thoughtful approach to the measuring. At times, you will need to ask questions, and at times you will not need to. Only by doing the work in a practical situation can you get the knowledge and experience that our discussion shows are necessary.

The detail covered in the various sections of the elemental analysis can be used as a checking facility for measuring to ensure that all relevant work is covered. The sections of work identified by each element, and the various categories listed under each sub-element, can be scanned as a means of identifying possible requirements in a given project being measured.

Example take-off

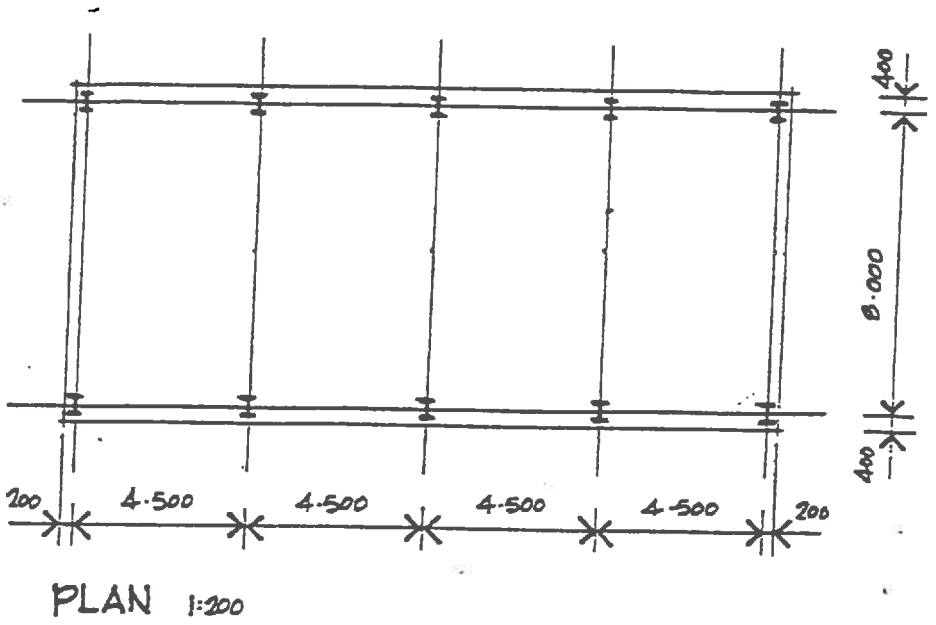


Fig. 1 Proposed warehouse

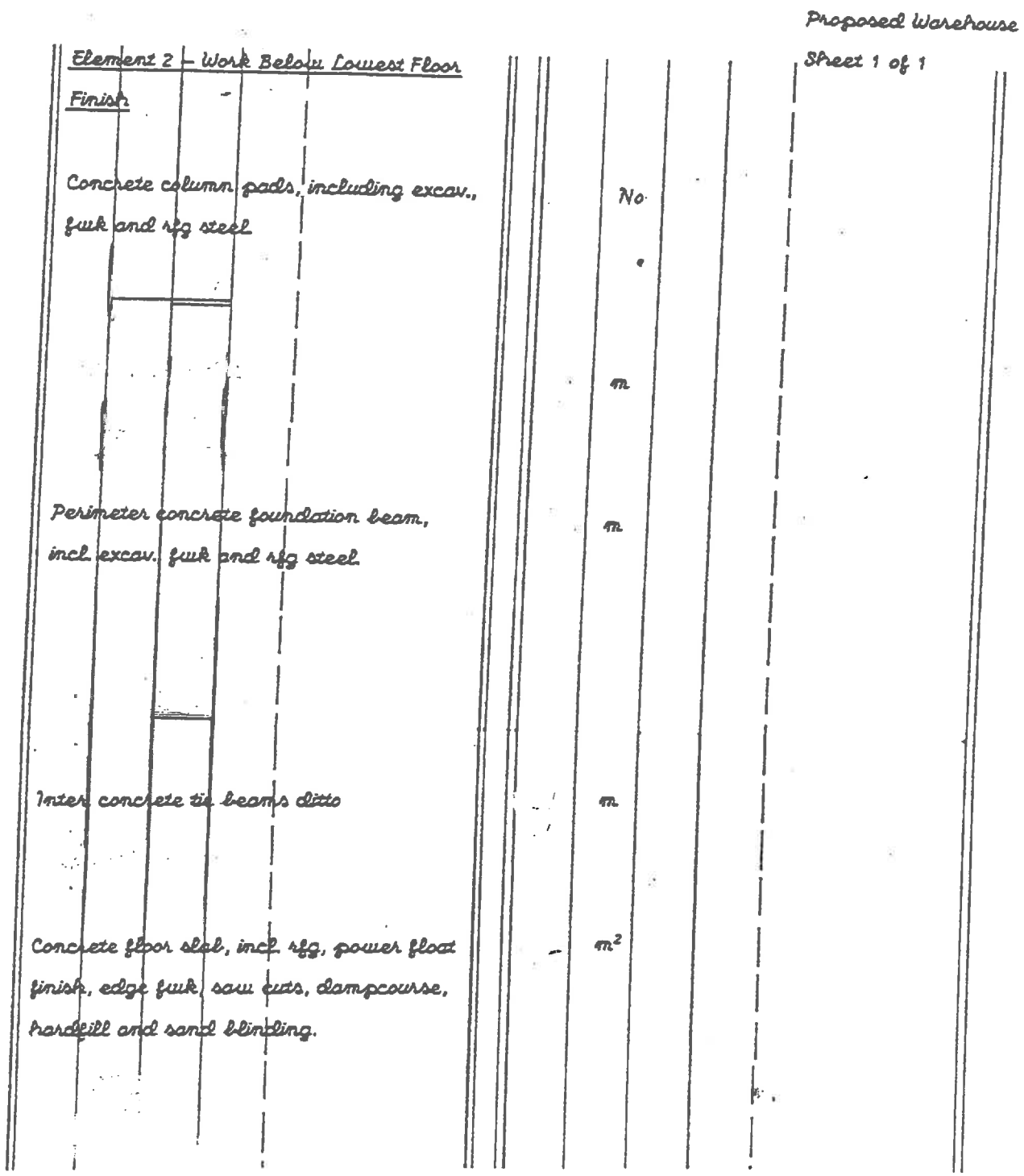
Our take-off example on the next page is for Element 2 to the warehouse shown in Fig. 1. Only the floor plan is shown as this is all we need for the take-off.

The take-off of Element 2 is based on the expected foundations for a building of this type on ground with good bearing conditions. The ground conditions must be established, because these can change the foundation requirements dramatically. Piling may be required in some circumstances.

As we are dealing with the measuring work only, we prepare the take-off on the basis of naming the components without giving any indication of sectional sizes. If sizes were noted on the drawings, we would include them. By not stating them, we let the estimator do the appropriate sizing through their rating of the items. The estimator would be more experienced in setting the size requirements. The estimator could also, by adjusting rates, take account of any extra size and/or reinforcing requirements necessitated by poor ground conditions.

Intermediate tie beams, across the building, have been measured, but their need could be questioned in this particular building. Where there is any such doubt, you are advised to measure the item and leave it to the estimator to come to a

decision or to ask a question of the engineer at some favourable future time. Always measure the work and then delete it if you find it is not required. This approach will minimise the chance of omission. Remember that you are setting the details and this means you should follow them all the way through by putting them in the measurements. Adjustments can be made later if required.



The power float finish has been included with the slab and not under Element 12, Floor Finishes. Element 12 would appear to cover finishes applied on the slab but not the finishing of the slab itself.

Look closely at the dimensions in the take-off. They are simple but not strictly net. The degree of error is, however, very small indeed.

Our take-off shows the measurement of bulk quantities, or sub-element units, for Element 2. In practice, the measurement of foundation bulk quantities from a floor plan may not be a reasonable way of doing it. If you have cost analyses of several buildings, you may find it is better to use an element unit rate, based on the area of the lowest floor. This would be seen as no less precise than bulk quantities where the drawings do not indicate foundation requirements.

REMEMBER

In measuring of work from sketch plans, you must provide the detail from your knowledge of previous similar buildings.

Where conditions, details, or specification levels may affect the estimate, you must be aware of these and ask any questions to provide adequate answers.

PRACTICE EXERCISE B

1. Can abbreviations be used in bulk quantity descriptions, and if so, when?

2. Sketch plans for a three-storey reinforced concrete building do not show sectional sizes of columns and floor beams. You have been asked to measure Element 3 for the estimator. How would you measure the columns and beams and why?

Answers to Practice Exercises

Exercise A

1. They have different purposes. Quantity surveying estimates aim to predict the tender figure, but builders estimates aim to predict the cost to the builder of completing the work.

2. Units of measurement for bulk quantities.

3. (a) Unit cost of element — gross floor area of building

   (b) Element unit rate — quantity of the element

   (c) Sub-element unit rate — bulk quantities.

Exercise B

1. Yes, when they are clearly understandable by someone else.

2. In metres as the estimator will determine the sizes through the rating of the items.

TEST PAPER 2

1. Element 10, Partitions, covers timber framed (10.1) and steel framed partitions (10.2). Under which elements would you measure the following work to such partitions:

   (a) All linings and trim?

   (b) All doors and frames?

   (c) All borrowed lights?

2. Demountable partitions (10.4) are measured in Element 10 inclusive of all linings, trim, finishes, and doors. In view of this, comment on the requirement to measure timber and steel framed partitions differently.

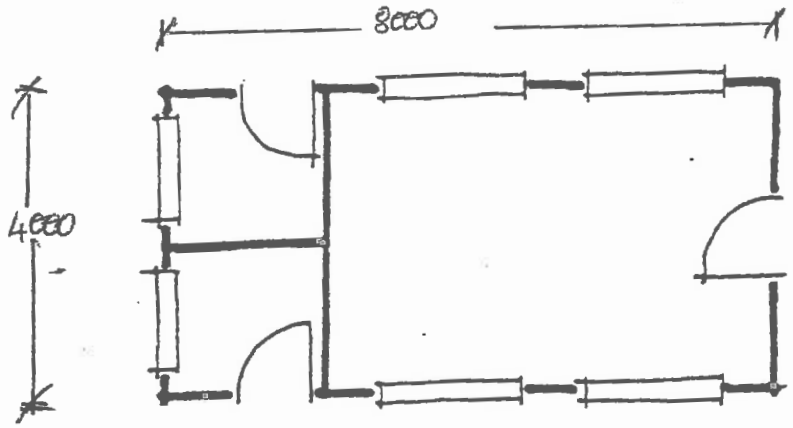
3. Measure elemental bulk quantities for the external walls, windows and doors to the building shown in Fig. 2. Brief specification is:

   External walls — 100 timber walls, R16 insulation batts, building paper, painted weatherboards, 9.5 painted gibboard inside.

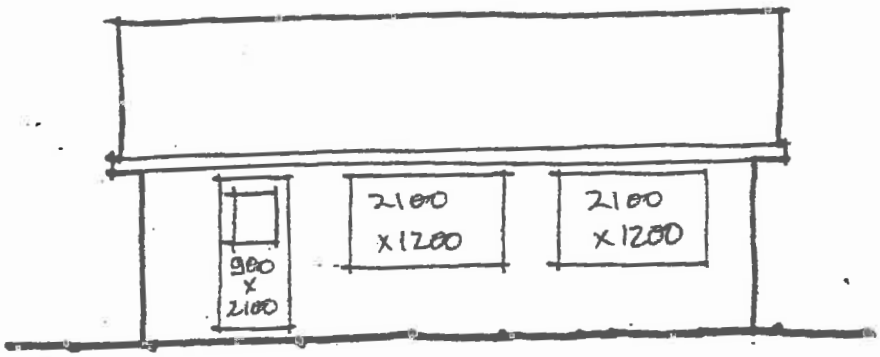
   Windows — Aluminium with timber reveals.

   Doors — Painted timber with glazed panel, 1980 x 810

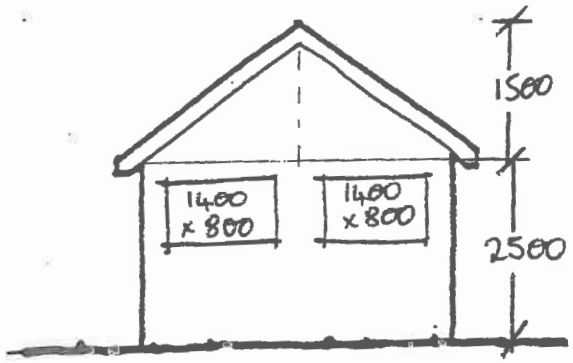
   You are required to present the take-off as shown in the assignment with descriptions properly filled out to cover *all* work included in the items. Do not extend the dimensions.



PLAN 1:100



ELEVATION



END ELEVATION

Fig. 2

decision or to ask a question of the engineer at some favourable future time. Always measure the work and then delete it if you find it is not required. This approach will minimise the chance of omission. Remember that you are setting the details and this means you should follow them all the way through by putting them in the measurements. Adjustments can be made later if required.

G.A.

Proposed Warehouse

Sheet 1 of 1

Element 2 – Work Below Lowest Floor Finish

Concrete column pads, including excav., fwk and rfg steel			
2/ 5 10	N,S	10	No
Perimeter concrete foundation beam, incl excav. fwk and rfg steel			
	4/4500 18000		
2/ 18.40 36.80	N,S 2/200 400		
2/ 8.80 17.60	W,E 18400		
54.40	3000		
	2/400 800		
	8800	4	m
Inter concrete tie beams ditto			
		55	m
3/ 8.80 26.40			
Concrete floor slab, incl rfg, power float finish, edge fwk saw cuts, dampcourse, hardfill and sand blinding.			
18.40	dims from above		
8.80			
161.92		162	m^2
		27	m