

NEPAL

Basic and Primary Education Programme Phase II

Development of Durable Textbook Pilot Project

**Production Management, Costing and Estimating,
and Paper Testing at JEMC**

11 March – 29 April 2000

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1 INTRODUCTION

1.1 Background

The consultancy visit to which this report refers was undertaken as one of the initial stages of a pilot scheme, which involves the production of school textbooks, using improved materials and sewn paperback binding, as part of the Basic and Primary Education Programme, second phase (BPEP II). As a necessary adjunct to the installation of new binding equipment, it was decided that management systems, chiefly production control, and costing and estimating, should be updated before the new equipment arrived. The consultancy visit took place between 11 March and 29 April 2000 and was based at JEMC

1.2 Consultant's brief

As a preliminary to the pilot project, IBD consultants have visited JEMC for varying periods, to carry out the necessary surveys, and make plans to implement the strategies. This report covers the design of new systems for production planning and control, and costing and estimating; together with training in the use of paper testing equipment, specified and purchased during a separate consultancy. The terms of reference are reproduced in Appendix IV.

Sincere thanks are due to everyone at JEMC, who gave such a warm welcome, and turned a difficult and complex task into a genuinely pleasurable experience.

Abbreviations

BPEP	Basic and Primary Education Programme
IBD	International Book Development Ltd
JEMC	Janak Education Materials Centre

2 PRODUCTION PLANNING AND CONTROL

2.1 The present procedure

The consultant worked with the Director, Department of Publications at Janak Education Materials Centre to examine the present system. Minor modifications were suggested which can quickly be added onto the existing system and will make it more easily usable by everyone concerned. The modified system will be implemented over the next few weeks.

The present system of production control has very basic documentation and relies upon a hand-produced production plan, which is produced by the Publications Department and passed into the production areas. This plan is updated whenever necessary by being completely re-written.

The camera-ready-copy (CRC) for the text is passed into the camera area, where it is processed into film and imposed to plate. At the same time, a works order is produced for the Printing Department by the Camera Department. This document consists of a pre-printed form, which is filled in by hand to give information on number of copies, number of pages, date of commencement, completion date etc.

A copy of this document is passed through to the Publications Department where it is checked against their records. The Printing Department then produces a works order for the folding department, which, in turn, produces an order for binding, and so on for each process. This continues until the job is finished.

Every process/machine fills in a pre-printed sheet, which details the operator(s) name(s), the title of the job, the number of units produced, and lists any problems or comments which may have arisen. This sheet is filled in at the end of every shift, and returned to the Publications Department which uses the information from it to check progress against their plan, and make any necessary revisions.

Any problems are discussed at the daily meeting, held every morning in the office of the General Manager of JEMC.

2.2 The modified procedure

The works order is to be produced and processed in exactly the same way; it is a sound system, which works well, and one with which all personnel are familiar.

Day-to-day planning of production will be done on a set of wall-mounted planning boards (designed by the consultant, and made in the JEMC workshops); one for printing, and one for binding. The boards will be kept in the area to which they refer. This will help supervision and machine operators to see their activities as part of the overall production of books, rather than as a process in isolation.

Each set of boards covers a 3-month period, and consists of 3 boards (one 4-week period per board) each for printing and binding, which have the dates written along the top; together with one fixed board for each area, upon which the machines involved are shown vertically (see examples in Appendix I). These boards are mounted on rails, fixed to the wall, and as each month's work is completed, the board for that month is removed from the front to the end of the rail, and becomes the next 4-week period in the cycle, with the new dates written in at the top. Each process is represented by a card showing the title of the job and the number of units to be produced, which is cut to the appropriate length against the time scale and placed in a channel attached to the face of the board. This provides a simple visual display and allows for the easy moving or re-programming of jobs and processes when necessary.

The consultant did suggest that planning should cover a 6-month period – but JEMC managers felt that 3 months is sufficient for the visual element of the planning process. In the consultant's opinion this is acceptable, as long as a record is also kept of the full production cycle for each element, including completion dates for each process, and that the required delivery dates are always regarded as the overriding requirement.

A fortnightly production meeting with the managers and supervisors is to be initiated, for the express purpose of discussing the plan, monitoring progress, and agreeing action to correct problems when necessary. Again, this will help relate each department's activity to those before and after it, so that everyone will be aware of the overall situation, rather than concentrating only on their own individual area.

In addition, a copy of the plan will be available at the regular morning meeting for managers and supervisors, to provide a basis for discussion and action in case of problems. The plan will be formally discussed in this meeting at least once a month.

An operations manual has been produced for the new system (see Appendix I). The Director, Publications Department, has been involved in the design of the new system, and he will gradually train Production staff in its use, beginning with supervision.

The operations manual is to be translated into Nepalese for use by all concerned. This translation is JEMC's responsibility.

3 PAPER TESTING EQUIPMENT TRAINING

3.1 List of paper testing equipment installed at JEMC

Equipment	Item measured
Paper Life portable paper balance	weight of paper and board
Hand-held dial micrometer	caliper of paper and board
Gurley-type densometer	porosity of paper and board
Elmendorf-type tear tester	tear resistance of paper and board
Colour Touch spectrophotometer	brightness, whiteness, and opacity of paper and board

3.2 Training procedure

The equipment was unpacked and assembled with the assistance of the Director, Publications Department and a young graduate trainee at JEMC. There were slight problems with some of the equipment. One small item was slightly damaged, and the manual for the tear tester was missing. These problems seem to have arisen during processing by Nepalese Customs and took some days to resolve. Further delay was caused by the necessity to organise a suitable power supply, including the provision of a voltage regulator (to avoid damage to the equipment from ‘spikes’ and drops routinely encountered on the standard grid).

Technical specifications for the text paper stock currently used at JEMC will be found in Appendix II.

Following some discussion, the technical specifications listed in Appendix II were identified as being the most relevant to JEMC’s requirements for durable books. Training was carried out by working through the tests required for these standards several times, checking to ensure complete understanding at each stage.

3.3 Training of personnel

Director, Publications Department and the graduate trainee were trained in the use of the equipment. Because of the delays caused by the previously-mentioned problems with the equipment, and holidays and strikes, it was not possible to train more JEMC personnel. However, the training carried out was very thorough, and these two will have little difficulty in ‘cascading’ the training down through the rest of the personnel who are involved in paper. The manufacturer’s manuals are extremely well-written, and cover the actual operation of the machines in a simple and easy to understand manner. In addition, the consultant has written a simple guide to the use of the equipment, which is to be translated into Nepalese (see Appendix II).

4 COSTING AND ESTIMATING SYSTEM

4.1 The existing system

The present system is quite detailed, but its main objective is to produce a set of management accounts once a year. All costs are classified either as direct or indirect costs. There is no attempt to establish actual costs for, or ascribe actual costs to, any activity or process. It is therefore not possible to make cost comparisons across the business – as a result of which the real cost of running the business is not known.

4.2 The new costing and estimating system

The British Printing Industries Federation (BPIF) devised a system of costing and estimating for printers, which has for many years been the standard in the UK and forms the basis for most systems used in Western Europe. Although the standard BPIF system is not suitable for use at JEMC as it stands, it provided a useful framework upon which a tailor-made system could be built.

A major difficulty with this particular project has been the lack of experience of conventional European-style costing and estimating within the plant. In effect, the consultant had to start from zero and explain the complicated area of cost accountancy. It took rather longer than was originally envisaged, and it is a tribute to the good nature and intelligence of the JEMC personnel that the project has got as far as it has in the relatively short time available.

In order to ensure understanding and the acceptance of the new system, it has been necessary for the consultant to devise and write a manual for a completely new and unique system, tailored to the particular requirements of JEMC. A process of constant consultation (and six complete re-writes of the working document) took most of the time. But the result should be (relatively) easy to understand and to use. The manual has been made as simple as possible, commensurate with actually providing a usable guide to the workings of the system. It appears in Appendix III.

The original intention was for the consultant to produce and install a system which was ready-to-use, and complete in every detail. Delays of various sorts (national holidays, strikes, and sickness of key personnel) have made this impossible. Instead, the consultant has delivered a system in 'kit form', which requires the addition of some key costs (which were not available by the completion date because the person who was to provide them was absent through sickness), and the calculation of actual cost rates (for which the key costs are essential). However, because the head of the costing function at JEMC has been involved in the project from the start, there should be no problem in completing the final stages. Actual implementation may have to await the return of the consultant later this year.

The system manual is to be translated into Nepalese, for easy access by everyone concerned. It is essential that there is a general understanding of the principles, as well as the workings, of the scheme.

4.3 Training of personnel

Staff training has taken the form of ongoing involvement, at every stage, of as many senior staff as possible. Mr Padmananda Shrestha and Mr Subarna Pradhan have been directly involved throughout the project, but, in addition, Mr Bimal Aryal, Mr Ram Chandra Silwal, and Mr Sujau Nepal were talked through the system, and their input incorporated.

5.1 General comments

The consultant was concerned to see that paper continues to be delivered, stored and handled in a poor fashion. There appears to be little improvement since the last visit (December 1999). One Heidelberg perfecter was running at 4,000 sheets per hour – rather less than half speed. Not only was it running slowly, but it was constantly stopping to clear damaged sheets from the feed. The paper is trimmed on two edges only (the other edges are untrimmed and rough) and was badly creased across the whole sheet. This problem continues throughout the whole production process and keeps output levels down to a fraction of what they should be.

In a sense, the introduction of Production Management, although a worthwhile exercise in itself, will not make a significant contribution to the running of the factory, until the problem of the paper is addressed. It is true that a better quality of paper is to be sourced. However, again, this will not have the required effect unless the state of the paper on delivery is also improved. There are just too many factors working against success – the method of delivery (packets wrapped in sacks) is unsatisfactory, the transport is unsatisfactory, the conditions of storage when the paper arrives at JEMC are very poor, and the handling and stacking of work in progress throughout the factory is not really good enough. In fairness, the latter may well stem from the state of the paper when it arrives, for there probably seems little point in careful handling, when the material is already damaged at the start of the process. One has to question the point of using sophisticated equipment to test things like whiteness and brightness of paper, when the most fundamental problem is torn and creased sheets – which can easily be identified by a quick visual inspection of the paper when it arrives at the plant.

The one factor which would make a huge difference to JEMC's ability to meet delivery and quality standards is the improvement of the physical state of the paper on delivery.

Some time was spent on organising a power supply for the new pre-press equipment, together with the provision of protection against supply problems.

5.2 Specific comments

The consultant is disappointed not to be able to report that all the systems (with the exception of paper testing) are installed and working. It is probably the case that the original plan was over-ambitious, given the conditions that exist at JEMC and the relatively short time available (seven weeks).

However, the production control system was almost ready and should be in use by the time this report is published. The costing and estimating scheme is complete, with all the elements in place for implementation upon the consultant's return to Nepal (June/July 2000).

One of the aims of the consultancy was to carry out some general management training while working on the more direct tasks, but this has not really been possible, except in the most general way. There really is a large gap between the situation at JEMC, and that at any Western equivalent. In a sense, the management at Sano Thimi has just evolved, without any of the functional guidelines that would have been available in a European counterpart. The traditional management structure is almost completely absent, and this absence, which could be a strength in a smaller, more entrepreneurial organisation, leads to a lack of direction and purpose.

JEMC has 'invented the wheel' for themselves. The result, although it has so far worked quite well in a purely Nepali context, will tend to hamper their attempts effectively to function in an increasingly competitive environment. There is a very real recognition at the higher levels of the JEMC management that what they do is not quite right. But support is needed to help them identify, prioritise and solve the problems.

5.3 Recommendation

The consultant recommends serious consideration of the following steps in JEMC:

- (i) The introduction of a general management training scheme, encouraging the acquisition of the type of management skills which exist naturally in more structured organisations. There should be some local resources available for this, such as the Staff College.
- (ii) The setting up of an 'exchange' scheme with a printer in a more competitive environment (perhaps India or Singapore). Many organisations are prepared to take bright 'students' from another country as trainees on a short-term (say, 3 month) basis. This would not necessarily be expensive. It need involve only modest expenses and very basic accommodation. However, it would allow the personnel concerned to experience, at first hand, more commercially challenging circumstances and certainly would broaden their perception of how companies function in the other parts of the world.
- (iii) A regular visit by a consultant, who can deliver technical advice and real ongoing support for their much-needed efforts to modernise their management structure. (This last point was suggested by the General Manager, and the consultant would support it as a real contribution to JEMC's very serious attempt to solve their problems.)

MANUAL FOR PRODUCTION MANAGEMENT SYSTEM

The following document was developed while the consultant was in Nepal as a working document and is at present in JEMC for revision and translation into Nepalese.

THE PRESENT PRODUCTION MANAGEMENT SYSTEM

The present system of production control has very basic documentation, and relies upon a hand-produced production plan, which is produced by the Publications dept., and passed into the production areas. This plan is updated whenever necessary by being re-written.

The present procedure is as follows:

The camera-ready-copy for the text is passed into the camera area, where it is processed into film and imposed to plate. At the same time, a works order is produced for the printing department by the camera department. This document consists of a pre-printed form, which is filled in by hand to give information on number of copies, number of pages, date of commencement, completion date etc.

A copy of this document is passed through to the Publications dept., where it is checked against their records. The printing department then produces a works order for the folding department, which, in turn, produces an order for binding, and so on for each process. This continues until the job is finished.

Every process/machine fills in a pre-printed sheet, which details the operator(s) name(s), the title of the job, the number of units produced, and lists any problems or comments which may have arisen. This sheet is filled in at the end of every shift, and returned to the Publications dept., which uses the information from it to check progress against their plan, and make any necessary revisions.

Any problems are discussed at the morning meeting in Mr Joshi's office.

The suggested new procedure is as follows:

The works orders is be produced in exactly the same way; it is a sound system, which works well, and with which all personnel are familiar. It has the additional advantage of making each successive department check the information provided by the one immediately previous to it, as well as by the Publications department.

It is suggested that the day-to-day planning of production should be done on a set of wall-mounted planning boards; one for printing, and one for binding. The boards will be kept in the area to which they refer; which will help supervision and machine operators to see their activities as part of the overall production of books, rather than a process in isolation.

Each set of boards would cover a 3-month period, and will consist of 3 boards (one 4-week period per board) each for printing and binding, which have the dates written along the top; together with one fixed board for each, with the machines involved shown vertically (see examples on pages 14 & 15). These boards are to be mounted on rails, fixed to the wall, and as each month's work is completed, the relevant board will be moved to the end of the rail, and will then become the next 4-week period in the cycle, with the new dates written in at the top. Each process is represented on the board by a card showing the title of the job and the number of units to be produced, which is cut to the appropriate length against the time scale and placed in a channel attached to the face of the board (Subarna is to source the channel). This provides a simple visual display, and allows for the easy moving or re-programming of processes when necessary. The consultant did suggest a 6-month period – but it is felt that 3 months is sufficient for the visual element of the planning process. This is fine, as long as a record is also kept of the full production cycle for each element, including completion dates for each process, and that the required completion dates are always regarded as the over-riding requirement.

The present hand-written plan will be replaced by a simple copy of the planning boards on a PC (there is a draft version available in Excel), this could be done very quickly, and would give a clear copy on A4 paper, which could be issued to the supervisors, and used for discussion at meetings etc. The disadvantage is that this copy would, of course, be in English (although the numerals are sufficiently similar to be understood by those who do not understand the English language as such). Subarna is to discuss this with the supervisors, and see if they would prefer to keep a version of the present handwritten sheets for this purpose. I had originally thought that the production control boards might be removed from their rails and photocopied for issue to the supervisors; however, the boards are too large for the photocopier.

A fortnightly production meeting with the managers and supervisors is to be initiated, for the express purpose of discussing the plan, monitoring progress, and agreeing action to correct problems when necessary. Again, this will help relate each department's activity to those before and after it, so that everyone will be aware of the overall situation, rather than concentrating only on their own individual area.

In addition, a copy of the plan will be available at the regular morning meeting for managers and supervisors, to provide a basis for discussion and action in case of problems. The plan will be formally discussed in this meeting at least once a month.

MANUAL FOR PAPER TESTING TRAINING

The following document is the manual written by the consultant for use at JEMC.

The technical specifications for the present paper supply at JEMC are as follows:

PARAMETER	SPECIFICATION	TEST EQUIPMENT
WEIGHT	60 gsm	Paper balance
BULK	75-90 microns	Portable dial micrometer
TEAR INDEX	4.0-4.6mN	Elmatear Digital Tear Tester
SMOOTHNESS	35 sec/10cc (average)	Not available
OPACITY	90%	Colour Touch Spectrophotometer
POROSITY	To be confirmed by Director, Publication Department	Densometer

The technical specifications for durable books at JEMC have already been established on a previous consultancy, and are as follows:

PARAMETER	SPECIFICATION	TEST EQUIPMENT
TEXT PAPER		
WEIGHT	70gsm	Paper balance
BULK (caliper)	90-110 microns (μ)	Portable dial micrometer
BRIGHTNESS	83%	Colour Touch Spectrophotometer
WHITENESS	135 CIE	Colour Touch Spectrophotometer
OPACITY	88%	Colour Touch Spectrophotometer
POROSITY	75 seconds/100mm ³ *	Densometer (Gurley method)
TEAR STRENGTH	To be confirmed by Director, Publications Department	Elmatear Digital Tear Tester
Gurley equivalent of 160 Bendtsen		
COVER BOARD		
WEIGHT	280gsm	Paper balance
BULK (caliper)	330-360microns	Portable dial micrometer
BRIGHTNESS	88%	Colour Touch Spectrophotometer
WHITENESS	98 CIE D65	Colour Touch Spectrophotometer
SMOOTHNESS	Top 15, Wire 350, Bendtsen	Not available
RIGIDITY	MD15, CD 7, Taber	Not available

TESTS

1. WEIGHT

This is tested on the paper balance. The paper balance is pulled upright within the box, and locked in the upright position with the slide catch. Release the small catch on the balance arm, and use the levelling screw to set the balance arm pointer on zero.

The larger of the two steel plates supplied is used for text papers. Place the sample on the bottom plate (the one with the pins), and place the top plate over it, to sandwich the sample between the two. Use a very sharp

knife (a craft knife or scalpel) to cut gently around the top plate – which gives a sample of exactly the right size.

Place the sample on the hook of the balance arm (using one of the holes made by the pins). Take the reading – which should be within +/- 1% of the gsm quoted by the mill.

Samples should be taken at random from several sheets, and readings taken from both the outer edge and the centre of the sheets.

The smaller of the steel plates is used for heavier grades of board, and is half the size of the other plate. When this is used, the reading on the scale is doubled.

After use, always ensure that the balance arm is secured with the small catch, and that balance is returned to the horizontal position. Return the sample plate(s) to their correct locations (note: it makes future use easier, if the ribbon is left sticking out from behind the plates when in the box).

Although fairly robust, the balances are delicate instruments – always treat them with care.

2. BULK

The dial micrometers are used to measure the caliper of the paper. Several readings should be taken across the sheet (there should be no more than 1 or 2% variation). Before use, make sure that the needle is on the zero – if necessary rotate the dial so that the reading is zero.

Holding the instrument firmly with the fingers through the grip, open the jaws by pressing the top lever with the thumb. Make sure the sample is flat within the jaws of the micrometer, and allow the spring mechanism to close and compress the sample – *do not squeeze the jaws closed*.

After use, return the micrometer to its case. These instruments should always be kept in their cases when not actually in use.

3. TEAR INDEX

This is measured with the Elmatear Tear Index tester. Detailed instructions for use of the instrument will be found in the manual, but the following points should be noted.

Follow the safety instructions on page 14 of the manual. Always check the level, in both directions, before commencing tests (instructions on levelling are on page 8 of the manual).

The standard sample size is 63 x 76 mm. There are two scales on the instrument, the NEWTON scale is the one to be used. Tests should be taken both with and across the grain of the paper. Samples should be taken from random positions on randomly-selected sheets.

Always keep the pendulum weights etc. in the case provided when they are not actually in use.

After use, make sure the power is switched off, the pendulum is in the rest position, and the machine is covered.

4. BRIGHTNESS, WHITENESS, AND OPACITY

These are all optical measurements, and are tested with the Colour Touch Spectrophotometer. Again, detailed instructions will be found in the manual, and the instrument is menu-driven; but the following points should be noted.

Most importantly – do not jab or press the screen. The screen is extremely sensitive, and the best operating method is to lightly touch it with the back of the finger. *Ignoring this instruction will result in damage to the screen. A replacement screen will cost approximately Rs50,000, and will take at least 3 weeks to arrive.*

Never insert fingers or any other object into the measuring chamber, it has a special white coating, which is easily damaged.

The machine has a screen-saver – which means that it will turn off the screen if it is left unused for about 15 minutes. To restore the screen, it is only necessary to touch it lightly.

In use, all the functions are accessible from the main menu screen. If a user gets ‘lost’ in the function screens, a touch on the **MENU** button at the foot of the screen will close the current operation and return to the opening screen. The process can then be re-started.

When measuring brightness, the C source should be used* (this represents indoor standard daylight), which is the condition under which most paper is processed and used. This is the ISO standard for brightness.

When measuring whiteness, use the CIE setting and the D65 illuminant; as specified in the quality document.

When measuring opacity, the ISO standard is used, in which R_0 represents the single sheet on the black sample plunger, and R_∞ represents eight layers (i.e. sheet folded 3 times). Note that the machine reads the R_∞ sample first.

The machine should always be switched off and covered when not in use.

5. POROSITY

Porosity is established by measuring the time taken for a standard volume of air to pass through the paper, using the densometer. This machine uses the Gurley method. The quality specification give a Bendtsen value of 160. Note that dividing 12000 by the Bendtsen ml/minute value will give the equivalent Gurley value; which in this case is 75 seconds / 100mm³.

For detailed instructions on use, refer to the manual, but the following points should be noted.

Follow the safety instructions on page 2 of the manual.

Use the 100mm³ band on the cylinder (i.e. the 2nd deepest silver-coloured ‘block’ reversed out of the black). Push the cylinder catch gently sideways, and lower the cylinder gently until you can feel it float on the oil. The timer will start and stop automatically when the band passes the head. Remember to press the red reset button before starting each test.

Never push the floating inner cylinder down; it will cause the oil to overflow.

Before raising the inner cylinder, always lower the clamp plate, and remove sample, calibration plate, or protective material. Otherwise, oil will be pulled into the air tube – which means that the machine will have to be stripped, thoroughly cleaned with alcohol, and refilled with oil (and there is not sufficient oil left to refill the machine).

* The D65 source is higher in ultraviolet, and represents outdoor standard daylight.

MANUAL FOR COSTING AND ESTIMATING

The present system is very detailed, but is mainly geared towards producing a set of management accounts once a year. All costs are classified either as direct or indirect costs. In a sense, terminology is not particularly important, provided that everyone is agreed on what an item is called and which category it goes into, and it is properly documented, then everything should be fine. The most important thing is to ensure that every cost in the business is recorded and incorporated into the cost budget for the year. The cost budget then forms the basis of the costing system, and when applied to the production processes, allows the 'recovery' of every cost within the business.

A major difference is that the new scheme is an on-going process, in which costs are constantly under review, and may easily be compared from department to department.

This document begins with a draft 'framework' for the new system – listing the categories which make up the cost base as in the standard BPIF system, and documenting which items of cost belong in which categories.

It then goes on to detail how these costs are obtained from existing records and built into a cost budget, how the budgeted hours are related to the total costs, and how the hourly cost rates are derived from these two factors.

Finally, it gives details of how the cost rates form the core of the system, and are used for cost budget and estimating purposes.

Our system is based on *full absorption costing*, in which the hourly cost rates, which allow the recovery of all costs within the factory, contain both the direct and indirect costs – the cost rates are then used as the standard units which relate to processes and activities within the plant for costing and estimating purposes.

28 April 2000

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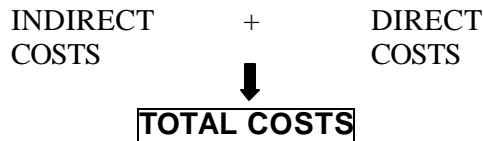
1. COSTING

COST BUDGET

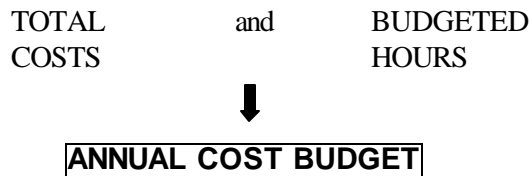
In order to obtain a cost budget, it is necessary first to build a cost base. The process of building a cost base, and using that cost base to calculate cost rates, which are then used for budget and estimating purposes, is shown below as a simple diagram.

THE PROCESS OF BUILDING AND USING A COST BASE

1. COLLECT ALL COSTS from records of previous years, divide them into:

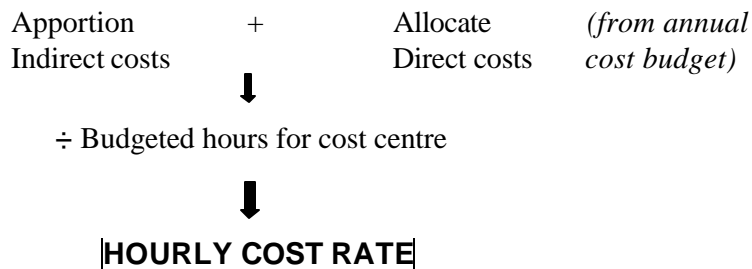


2. CALCULATE BUDGETED HOURS from records of previous years

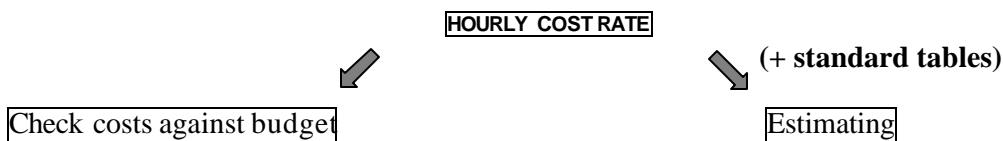


3. IDENTIFY COST CENTRES – these are **Productive processes only**

4. CALCULATE HOURLY COST RATES for each cost centre



5. USE HOURLY COST RATES FOR BUDGET AND ESTIMATING



The process of building a **cost base** is as follows.

The first step is to find the **total** annual cost of running the business. To do this, we must identify all the people and assets within the factory, and record them as either **INDIRECT** or **DIRECT** costs. (It is not necessary to divide the costs for **budget** purposes; but it simplifies **cost rate** calculations).

A. INDIRECT COST generally defined as cost which does not arise *directly* from production, and usually grouped under the following headings:

LAND & BUILDINGS – charged as ‘notional rent’; i.e. the rent that would have to be paid, if these were not owned. These are assets of the business, and proper provision must be made for recovery of the original outlay, and possible replacement.

PLANT AND MACHINERY – the capital cost of every item in the plant, depreciated over an agreed period; the cost of smaller machines (such as electric drills and test equipment), is combined into an agreed category and estimated for this purpose. Does *not* include the cost of production machinery.

ADMINISTRATION COSTS – the cost of people and items within the business which do not contribute *directly* to the manufacture or production of saleable goods. This category includes management salaries (including directors and managers, sales & marketing etc.), desks and office equipment, office space, stationery, cars, telephones, fax machines, photocopiers, wages for non-productive staff (cleaners, maintenance staff and engineers, stores staff, canteen staff etc.), insurance, uniforms, medical services and medicines. Supervisors’ wages, spare parts, chemicals etc., are included under **administration costs** for *cost budget purposes*, but are recorded as separate items within those costs. (Because they will be *recovered* as **DEPARTMENTAL OVERHEADS**, by adding them into the **hourly cost rate** calculation for each department [and cost centre] as a separate item, see page 28 for details.)

WORKING CAPITAL – the amount of money used for the day-to-day funding of the business, plus the cost of any borrowings; calculated at normal interest rates.

POWER – normally electricity, calculated at cost per kilowatt/hour – but note that power used for production purposes will be charged *directly* to the process.

FUEL – any fuel used within the plant, including paraffin or gas for heating, fuel for vehicles etc.

WATER – this would also include any charges for sewage etc.

RATES, LOCAL TAXES – including charges for waste removal etc.

STORAGE AND INVENTORY – storage refers to raw materials, inventory is finished goods. Some allowance for this is made in the overhead; usually calculated as a percentage of the value.

All this information will be found in the records of previous trading years – such as the profit and loss account, and the balance sheet.

These **INDIRECT** costs are totalled. These costs are also referred to as **OVERHEAD** costs, or **GENERAL OVERHEADS**. A list of the indirect costs at JEMC will be found on the opposite page.

INDIRECT (OVERHEAD) COSTS

	1998	1999
Notional Rent, land and buildings	8315424	8315424
Director's fees	172041	241010
Salaries and wages	17243811	20520859
Electricity and water	5769504	4140902
Transport and vehicles	1760717	2602390
Maintenance of buildings etc.	1251226	1169091
Insurance	1047236	1180651
Stationery	495535	664704
Postage and stamps	813891	656122
Newspapers	197427	196511
Travelling allowances etc.	1051587	1033260
Bank charges and interest	11752322	15819020
Advertising	1162870	1348747
Donations and prizes	705305	699030
Training	160037	269494
Fees to Book, and other committees	582890	305552
Audit Fees	50000	50000
Professional Fees	292271	444687
Depreciation of non-production machines	1938272	1938272
Depreciation of office equipment	159970	386844
Maintenance of machines	282233	638846
Transport of finished goods	1848936	1249891
Chemicals	697733	595904
Rents	361913	248510
Rates	1197070	235463
Miscellaneous	107871	1659793
	<u>58720359</u>	<u>66015073</u>

B. DIRECT COSTS may be any defined as cost which is caused as a *direct* result of a productive activity

WAGES – paid to staff directly involved in production.

COST OF MACHINE – capital cost of a *production* machine, depreciated according to tables supplied by Auditor-General’s office, to give an annual cost.

POWER – the cost of the power consumed by machine.

These costs are incorporated into the **cost budget** as **direct costs** since they arise *directly* from the process to which they apply – i.e. wages are paid, whether or not the people concerned are working, the machine has to be paid for, whether or not it is running. They form the *direct* part of the cost rate, and their costs are directly *allocated* to the production process to which they apply. The machine consumes no power when it is not running; but when it runs, the power it uses is a *direct* cost, and is *allocated* to the cost centre. A list of direct costs at JEMC will be found on page 25.

Other items of direct costs for **cost budget purposes** are **direct materials**. Since the cost of these are **recovered** by charging them directly to individual jobs, they are best recorded under their separate headings (i.e. paper, board, ink, glue, chemicals etc.), which will make life easier when calculating **cost rates**.

Some items do not obviously fit into either the indirect or the direct category. An example of this is design; if the cost can be charged directly to a job, then it is recovered by doing so. If it cannot be directly related to an individual job, then it will have to be treated as an *indirect* cost, and *apportioned* as part of the **general overhead**.

Whichever category is decided for an individual item, the cost will still be incorporated into the final cost rate. When the *indirect* and *direct* costs are added together the total forms the basis of an annual **cost budget**, and this should contain every cost within the business over the budgeted year. However care should be taken; putting some items into a particular category may cause complications in the calculation of **cost rates** later on.

Producing a cost budget also includes recording total hours worked, numbers of staff involved in each process, working weeks in the year (holiday allowances, estimates of sick leave etc.). This gives the **budgeted hours** for each process (details on page 26).

CONSULTANT’S NOTE

In the opening paragraphs of this document, the point was made that terminology is not important, and that the system should be tailored to suit JEMC. This is true – but it is strongly recommended that the standard Costing System should be followed whenever possible, for four reasons:

- 1. The standard system has been developed over a number of years, and it works!*
- 2. At some point, another consultant may take over this project – it makes life needlessly complicated for everyone, if long explanations have to be given for every change in the system.*
- 3. At the moment, there is a team of people involved in developing this scheme – these particular individuals may not be available at a later date to explain deviations from the standard scheme.*
- 4. At some point in the future, this system will almost certainly be computerised. This process will be made more difficult if deviations from the standard system are not kept to a minimum.*

COST BUDGET ANALYSIS FORM – DIRECT COSTS

WAGES	DEPRECIATION		POWER		BUDGETED		WEEKLY
	1998	1999	1998	1999	1998	1999	HOURS*
Pre-press	229370	252300	957609	957609	392040	392040	72
Printing							
Sakurai	113728	125100	1426545	1426545	172800	172800	72
Komori	189545	208500	5187436	5187436	639360	639360	72
Miller	165545	182100	297297	297297	302700	302700	72
Heidelberg	189545	208500	379739	379739	397440	397440	72
Heidelberg	75818	83400	379739	379739	60120	69120	72
Komori	99327	109260	188910	188910	172800	172800	72
HMT	113727	125100	250313	250313	141696	141696	72
HMT	99327	109260	250313	250313	83808	83808	72
Harris	99327	109260	250313	250313	83808	83808	72
Harris	66219	72840	250313	250313	32141	32141	72
Binding							
Shoei Folder	70735	77808	788091	788091	155520	155520	72
Shoei Folder	70735	77808	788091	788091	155520	155520	72
Shoei Folder	70735	77808	788091	788091	155520	155520	72
Shoei Folder	70735	77808	788091	788091	155520	155520	72
Shoei Folder	70735	77808	788091	788091	155520	155520	72
Shupan	397339	437070	4054575	4054575	711936	711936	72
Itoh	265364	291900	2365170	2365170	153792	153792	72
Yoshino	265364	291900	107421	107421	547776	547776	72
Yoshino	265364	291900	107421	107421	139968	139968	72
Schneider	75818	83700	40901	40901	77760	77760	72
Schneider	113727	125100	41797	41797	77760	77760	72
Itotec	99327	109260	778115	778115	86400	86400	72
New Line							
Shoei Folder							
Gatherer							
Sewing m/c 1							
Sewing m/c 2							
Binding line							
3-knife trimmer							
Lamination							
Shrinkwrap							

Materials	1998	1999
Ink	1557758	2275117
Paper	100837128	116405241
Chemicals	697733	595904
Other raw materials	4670386	5926813
Spare parts	2078622	2893790
Writers Charges	-	240000
Outwork	92761	1032706
Packing	692407	751341

*6 hour double day shift, 6 day week, 50 weeks per year

COST CENTRES

All businesses earn revenue by charging customers for the finished goods they produce. The costs in the **cost budget** must therefore be spread over those areas which are directly involved in the production of finished goods, so as to **recover** these costs. These areas are called **cost centres**, and the costs of each **cost centre** are **recovered** from customers by charging their activities to individual jobs at an **hourly cost rate** (via the invoice). After discussion it has been agreed that the best way of doing this is for each machine or process to be defined as a **cost centre** .

Direct costs which arise as result of the activities of a particular **cost centre** are *allocated* directly to that **cost centre** . A share of those costs which are not *directly* related to production (**indirect costs**, or **overhead costs**) are *apportioned* to each **cost centre** . In this way, the total costs of running the business (i.e. the total amount in the **cost budget**) are distributed among the **cost centres** .

Note the difference between allocate and apportion:

Allocation refers to the process of charging an expense directly to a cost centre; because the cost arises directly from that activity or process. For example the wages of printing machine operatives.

Apportion means to charge a share of an *indirect* cost or *overhead* to a cost centre. An example of this would be the *apportionment* of the cost of land and buildings (notional rent!) to a process such as folding. The area occupied by the folding department is calculated as a percentage of the area of the factory site as a whole, and the resulting percentage of the cost of land and buildings is then *apportioned* to the folding department. Dividing this sum by the number of machines in the department gives the *apportionment*, or proportion of fixed costs, for each machine.

In practice, the *indirect* elements (or **general overhead**) are totalled, and the total is *apportioned* across the production areas. To do this, the **total indirect cost** is divided by the **total area** of the factory, to give a **general overhead cost per square metre** . An example of this process follows:

EXAMPLE

Total overhead cost = 66015073 Rs (see page 23)

The total area of the factory = 100683 sq metres

then the overhead cost per square foot = $\frac{\text{Rs}66015073}{100683 \text{ sq metres}}$
= **Rs655.672 / Sq metre of area per year**

This **general overhead cost per square metre** is then *apportioned* to each **cost centre** on the basis of the area occupied by that **cost centre** .

The **direct** and **indirect** costs for each **cost centre** are added together and this total, together with the **total budgeted hours**, is used to calculate an **hourly cost rate** for that cost centre. This cost rate will be used to measure progress against the cost budget, and is also used for the purpose of estimating the cost of future jobs.

NOTE

The following categories are also *direct costs*, but although they are included in the **cost budget**, THEY ARE NOT INCORPORATED INTO THE HOURLY COST RATE, since they are consumed in direct proportion to the amount of goods produced, and are **recovered** by being DIRECTLY CHARGED to **individual jobs** via the invoice, rather than to **cost centres**:

DIRECT MATERIALS – such as paper, board etc., which are directly used to produce goods for sale, and to which are added handling charges (allocated as a percentage of either weight or value). If these items are stored for any length of time, then the extra cost of this is normally recovered by increasing the handling charge.

In the case of other **direct materials**, such as ink, chemicals, glue etc., although the amounts used vary according to the quantity produced, it is difficult to charge the actual cost directly to an individual job. Instead standard tables are used, which relate the cost to the quantity, and a standard charge is made based on these.

One other item is also a direct cost, but is not always easily categorised:

OUTWORK – in some cases the outwork varies directly with the quantity produced, and therefore may be charged directly to a job at cost + a handling charge; in others it would have to be included as part of the **general overhead**, and *apportioned* on a departmental basis. It remains to be seen how best to handle this at JEMC.

CALCULATION OF HOURLY COST RATES

As explained earlier, the hourly cost rates are made up of both **direct** and **indirect (overhead)** costs. In addition, production departments are divided into two classes when calculating cost rates:

SINGLE OPERATIONS – usually hand operations, with single operators; the hourly cost is calculated by dividing the total cost by the number of hours available. Examples of this would be: camera, film planning, the new MACs etc. The whole department (as defined by the activity) is the cost centre, and has a *departmental cost rate*.

MULTI-OPERATION – usually machines, involving a variety of operations and processes, and several operators. Because different machines have different values, and varying numbers of operators, the **cost rates** will vary from machine to machine. In these cases, the *individual machines* are considered as cost centres, and the cost rates calculated on this basis. Examples include: printing, machine folding, sewing, etc.

Factors involved in calculating cost rates

The cost rates must be based on the number of direct hours that are **budgeted** to be achieved at each cost centre – making allowance for such factors as shift patterns and non-productive time (e.g. washing-up and standing time, holidays, sickness etc.). Machine **cost rates** must be based on the actual productive hours in a year. Production records can be used to determine hours actually worked, and realistic cost rates are based on these.

So, as an example, here is how the cost rate for a Heidelberg single colour press would be made up:

THE INDIRECT ELEMENT (OVERHEADS)

The total area occupied by the printing department is 680 square metres. There are 12 machines in the printing area, so each machine's 'share' of the area would be 56.67 square metres. But the machines vary in size, value, and capacity. So, we must make a fairer allocation of the area.

In the Janak machine room there are 2 perfectors, 2 perfector/2-colours, and 8 single colour presses. The perfectors and the 2-colours will occupy more space (and add more value) than the single colour presses. We therefore make an estimation of the comparative value of the machines to the business. We might decide, for instance, that the Komori perfectors and the Heidelberg perfector/2-colour are 'worth' twice the value of the single colours, and the Miller is worth one-and-a-half times the value. So, the total area will be divided by 15.5, rather than 12, and the overhead would be *apportioned* on this value, rather than a straight share of the area. In this case each single colour press would be *apportioned* 43.87 sq.metres, the Miller 65.81 sq. metres; and the Komoris and the Heidelberg Speedmaster each 87.74 sq. metres.

The cost is calculated by multiplying the area occupied by the machine (43.87 sq.metres) by the overhead cost per square foot per year (Rs655.672 see page 26). The **general overhead cost** for the Heidelberg would therefore be Rs28,764.35 per year.

In addition, there are certain **overhead costs** which arise on a *departmental* basis, and are referred to as **departmental overheads**. One example would be supervisor's wages, another would be chemicals (fountain solution) in the printing department.

Wages for supervisors are *apportioned* to each machine on an area basis in the same way as the **general overhead**; this has the benefit of relating supervision costs directly to the area supervised – any area requiring extra supervision will automatically raise the cost rate of that area. Unfortunately, this figure is not available, and will have to be obtained from Mr Shrestha, on his return from sick leave.

The cost of chemicals (fountain solution in the printing department) is *apportioned* on area, and added to the **departmental overhead** in exactly the same way, the total chemical cost is Rs595,904, so the Heidelberg's share will be Rs13,583.41.

The cost of chemicals in the platemaking section (developer etc.) would be apportioned in exactly the same way for that department. Due to Mr Shrestha's absence, this figure is not available either, and will have to be obtained upon his return.

The **INDIRECT ELEMENT** (i.e the total of the **general overhead** and the **departmental overhead**) is added to:

THE DIRECT ELEMENT

1. The cost of the machine, calculated as its *depreciation* rate for the year

The Auditor-General's tables give 12% as the annual rate of depreciation, so the annual cost of the machine will be Rs379,739 (see table on page 25).

2. The cost of the power used by the machine

This is based on the units of electricity used by the machine, and measured in kw/hours. For the Heidelberg, the cost of power is Rs 69,120 per year (see table on page 25). (NB the machine uses power even when non-productive; e.g. washing-up etc.)

3. The wages of the operators

There are two operators on the Heidelberg, and the annual wage cost is Rs 83,400.

4. The cost of spare parts

It has been decided to treat this as a **direct cost**, and *allocate* it directly to the machine concerned; this ensures that the higher running costs of older machines are not unfairly distributed across newer, more efficient units. Again, this figure will have to be obtained from Mr Shrestha upon his return.

<i>Remember that direct materials costs are charged directly to the job.</i>

The *indirect* and *direct* costs when added together will give the basic cost of the machine (or **cost centre**).

In order to find the true hourly cost rate, allowance must be made for the actual productive activity of the machine; which will not be its theoretical capacity. The press is budgeted to be productive for 36 hours out of a possible 48 in a week, and there are 50 working weeks in the year, so the hourly cost rate is based on the annual cost, divided by 50 working weeks and then divided by 32 working hours.

Therefore, to continue with our Heidelberg press example:

Weekly cost

General Overhead,	Rs 28,764.35 per year ÷ 50 working weeks	Rs 3,974.47
Departmental Overhead,	Mr Shrestha to advise this figure	Rs ??????
Capital cost (see above),	Rs 379,739 per year ÷ 50 working weeks	Rs38,297.87
Power (see above),	Rs 69,120 per year ÷ 50 working weeks	Rs 4,320.00
Wages (see above)	Rs 83,400 per year ÷ 50 working weeks	Rs 5,700.00
Spare parts	Mr Shrestha to advise this figure	<u>Rs ??????</u>
Total	Rs	

The machine works a double shift, and budgeted *direct* hours per week is 72, so the **hourly cost rate** for the machine is the total above ÷ 72 = **Rs?.** If the budgeted *direct* hours per week changes, then the cost rate is changed accordingly, so as to recover the same amount of costs over the increased or decreased period available.

If the wages or the cost of power increase, the direct part of the cost is increased accordingly (but **not** the *overhead*).

NOTE If the number of working weeks in the year varies, then the cost rate must be varied proportionately, in order to recover the costs over the altered period.

Following this basic procedure, a cost rate is calculated for every **cost centre** within the factory.

In order to document this, and to ensure consistency, a standard form is used, and the completed forms are filed within the Costing department, to provide a permanent record of the cost rate calculations. The form is dated, and if any of the factors are altered, then a revised form is produced (with the date of the alteration) and kept on file.

These records will be used to keep the cost files up-to-date, and the cost rates are also used, in the form of tables, for the purpose of Estimating (see Estimating section for details).

An example of a suggested standard Cost Centre Analysis Form is on page 31.

COST CENTRE ANALYSIS FORM

BUDGET CENTRE _____

COST CENTRE _____

DEPT.FLOOR AREA _____ % OF TOTAL FACTORY FLOOR AREA _____

FLOOR AREA *APPORTIONED* TO COST CENTRE _____

ANNUAL DEPRECIATION COST OF ASSET _____

DEPRECIATION RATE _____

NUMBER OF OPERATIVES _____

POWER REQUIREMENTS
(in kilowatt hours) _____

BUDGETED DIRECT
HOURS PER WEEK _____

WORKING WEEKS
PER YEAR _____

GENERAL OVERHEAD _____

DEPARTMENTAL OVERHEAD _____

CAPITAL EMPLOYED _____

COST OF POWER _____

WAGES _____

COST OF SPARE PARTS _____

TOTAL COST _____

HOURLY COST RATE

Total cost ÷ number of budgeted direct hours in a week = _____

Date

HOW COST RATES ARE USED

We have seen how the annual cost budget is derived, and how the cost rate for each cost centre is calculated. This information is used to check costs against the **cost budget**; but the same figures are also used as the basis on which to **estimate** the cost of producing future work, (as shown in the diagram on page 21). Additionally they may be used to compare costs in one area against those of another similar area.

A costing system is a powerful tool for monitoring and controlling costs within a business. In order to do this effectively, the system must be set up, and administered, properly.

THE PROCEDURES TO BE FOLLOWED

The essential requirement of the system is for a record to be kept of exactly how much every job cost to produce.

When the original job specification for a title is issued by the Publications department, at the same time a record, usually referred to as a **Job cost file** will be opened for that individual title. A recommended practice is to keep costs on each job in the form of a loose-leaf folder, using a separate sheet for each cost centre; with the first (top) page being a summary sheet of the costs – the summary, of course, will not be completed until the last activity in the factory is finished.

This cost file is kept in the costing office, and it is that office's responsibility to record details of materials used, hours worked on the individual job by each cost centre, onto the correct cost sheet, and then to total the costs onto the summary sheet for that title. It should also note any problems encountered, their cause, and the solution applied to the problem. An example of a Job cost *summary* sheet is shown on page 33.

The information recorded on the Job cost sheets comes from the following sources:

The *materials used* are recorded against the job, as they are issued to each department, on a **materials daily return** or record form. This is a standard form, returned from the stores every day to the costing office, showing materials issued to departments against each job. An example of a standard form is shown on page 34.

The *hours worked* are taken from the **shift production record** produced by each department, showing machines, operator(s) involved, title worked on, units produced, problems encountered etc. This document provides a permanent record of the actual labour cost; and the information from it should be entered onto the **Job cost sheet** for the individual title, together with materials used on that title, from the materials docket; on a regular (usually daily) basis, in the costing department. At the end of the production process, this cost sheet will provide a permanent record of the total **actual cost** of the job.

The actual cost may then be compared against the estimated cost; if there are significant variations, these should be investigated, and the causes noted. It may be necessary to modify the machine speeds and output rates used for estimating (see Estimating section for details).

NOTE The process of creating and administering accurate cost records is time-consuming and demanding. Although there is an existing costing department, it may be necessary to employ extra staff to keep up with the increased workload.

JOB COST SUMMARY SHEET

TITLE

START DATE

NO. OF PAGES

COVER

ORDER QUANTITY

Rupees

PRE-PRESS DIRECT HOURS

..... @

PRE-PRESS DIRECT MATERIALS

PRINTING DIRECT HOURS

Make-ready..... @

Running @

Wash-up @

PRINTING DIRECT MATERIALS

Ink

Fountain solution

BINDING DIRECT HOURS

Folding @

Gathering @

Sewing @

Saddle stitch @

Side-stab @

Laminating @

Covering @

3-knife @

Shrinkwrap @

BINDING DIRECT MATERIALS

PACKING DIRECT HOURS @

OUTWORK

TOTAL COST _____

NOTES

2. ESTIMATING

PRINCIPLES OF ESTIMATING

If each cost centre is productive for its budgeted direct hours, the customer is charged the budgeted rate for the job, and the materials used are accurately recorded and charged for; then the annual income will equal the annual cost. However, in practice this rarely works out precisely – there are always mishaps, operators off sick, materials wastage, machine breakdowns etc. In any case, we do not want to exactly balance the costs against the income. The normal objective is to make a profit, and to do this, we have to charge the customer the cost of the job + a profit margin.

Before work commences, we must produce an accurate estimate of how much each job will cost in overheads and direct costs; for which we use our **hourly cost rates** (which contain the overheads + the direct costs of labour etc.), plus the cost of any materials required (with their handling charge). Any required margin of profit is added onto this estimated job cost. For estimating purposes the cost rates are provided as a table, showing each **cost centre**, and its hourly **cost rate**. Whenever the cost rates are revised, then a revised table will be produced.

The details of the estimating process are as follows:

1. the estimator lists the processes through which the job will pass, and estimates the time which the job will take in each process, using **standard output tables** (see Appendix A) which show accurate outputs of all the available plant. The data in these standard tables is based on production records from past years – but they should be constantly monitored and updated.
2. This estimated time is then multiplied by the **hourly cost rate** (from the standard tables showing **cost centres** and **hourly cost rates**; see Appendix B) for each process, to give the cost.
3. To this is added the estimated cost of the **materials** used, together with the cost of any **outwork** required. For consistency, and to help the estimator to make sure that everything has been included, a standard form is used for this purpose. An example of a standard form is on page 36.

The estimator must be quite certain that every cost has been included in the estimate, and that the estimate reflects the methods of working on the factory floor. For example, if a cover is to be printed 2-up, then the estimate should allow for this, and any extra materials must be included in the estimate. Any assumptions made in the estimate should be noted on the form, so that they may be allowed for when the actual job is put in hand.

Every estimator should have a copy of the **plant list** (see Appendix C), which has a detailed specification of minimum and maximum sizes, together with any special limitations, for every machine within the factory. Estimators should be familiar with all the processes within the factory, and have a good knowledge of the workings of these processes.

Many processes have special factors to be taken into account when producing estimates, such as: allowances for grip on printing presses, print finishing and binding allowances for extra paper, wastage and overs allowances for make-ready and printing and finishing. These are included in the PAPER AND BOARD WORKING ALLOWANCES, which will be found on page 37. Other factors to be taken into account include ink usage, which for estimating purposes at JEMC is based on past consumption records.

PAPER AND BOARD WORKING ALLOWANCES

Sheet fed presses

Grip – 10-12mm

Colour control strip – 10mm

Print finishing/binding allowances

Trimming – single cuts 3mm, double cuts 6mm

Binding/sewing lap – 9mm

Lamination – 12mm

Perfect binding – 6mm in the backs (i.e. 3mm for each leaf)

Wastage and overs allowances

Sheet-fed, single colour – 100 sheets/ first make-ready, 50 sheets for each subsequent make-ready

Sheet-fed, two colour – 200 sheets/first make-ready, 100 sheets for each subsequent make-ready

Sheet-perfector Plus 3%overs/running waste for each pass through the press (includes overs for finishing)

General finishing allowance

For normal binding operations 2%

Unusual or difficult materials will require special allowances.

At the end of every job, the actual total cost (from the **Job cost summary sheet**) is compared with the estimate. If the actual cost is significantly different, then the source of the variance should be identified, and appropriate adjustments should be made to assumed rates of output, materials usage, etc. in the standard tables; in order to improve the accuracy of the estimating process.

In view of the relatively standard product at JEMC, it may be practical to produce tables for standard formats and extents, which would avoid the necessity of producing individual estimates for many books. However, in order to do this, it is first necessary to have a complete costing and estimating system installed and running.

NOTE – as with costing, the process of estimating is time-consuming and demanding. Since there is no existing estimating department as such, the system will have start from the beginning. It has been suggested that individual departments (possibly the supervisors) should be made responsible for producing their own parts of job estimates. The consultant would advise against this – although it is true that individual departments probably know their own part of the production process better than anyone else, this would be outweighed by the lack of consistency in the estimating procedures. Experience has shown that estimating is a process best left to staff specially trained in the discipline.

APPENDIX A

ESTIMATING STANDARD TABLES

(Please note that these are the consultant's educated guesses at what the rates would be. Mr Subarna Pradhan is to check these, and revise them where necessary, to give actual rates)

PRE-PRESS

MAC setting

	<i>simple text</i>	<i>tabular</i>
A5 page	15 minutes	30 minutes
A4 page	30 minutes	60 minutes

Creating photographic masks – per overall area

Light 15 minutes	Medium 30 minutes	Heavy 60 minutes
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Retouching / spotting-out

18 x 24cm film 5 minutes	60 x 80cm film 30 minutes
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Scanning

Monochrome scanner	per squared-up halftone 2.5 minutes	
Colour scanner	set-up time 5-15 minutes	
Minimum scan 5-10 minutes	A4 scan 5-15 minutes	A2 scan 10-20 minutes

Note: scanning times will vary according to originals, amount of grouping, and the scanner

Disk handling (standard check)	5 minutes per file
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Disk conversion	Set-up 10 minutes + 30 minutes per 12-page A4 disk
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Make-up

Preparing imposition layouts / laydowns

2 pp 5 minutes, 4 pp 10 minutes, 8 pp 15 minutes, 16 pp 20 minutes, 32 pages 30 minutes

Assembly / paste-up <i>paper</i>	3 minutes per piece of material
Assembly <i>film</i>	5 minutes per piece of material

Preparing masks by hand

Simple mask 15 minutes	Complex mask 60 minutes
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PRE-PRESS continued

Camera / contacting

<i>Camera</i>	per line shot 5 minutes	per tone shot 10 minutes
<i>Contacting</i>	per line film 3 minutes	per tone film 5 minutes

Imposition, planning to assembled film/flat from existing layout/laydown per colour (by hand)

2 x A4	10 minutes
4 x A4	20 minutes
8 x A4	40 minutes

Proofing

1 set 16pp A4 photocopies (black)	15 minutes
1 x B1 size ozalid (one colour)	10 minutes
1 x DTP visual proof (4-colour)	5-10 minutes
1 x Iris ink-jet (4-colour)	20-30 minutes

Litho platemaking times per plate

Pre-sensitised aluminium plates	
SRA3 (450 x 640)	10 minutes
SRA2 (640 x 900)	20 minutes
SRA1 (900 x 1280)	30 minutes

MACHINE PRINTING**Sheet-fed offset litho**

	Make-ready/set-up			RUNNING – IMPRESSIONS PER HOUR			
	1 ST	FOLLOW- ON	WASH- UP	Up to 3000	3000- 10000	10000- 20000	20000+
Sakurai	90	30	30	4500	4500	5500	6000
Komori perf.	120	60	45	4000	4000	4500	4800
Miller	120	60	45	3900	3900	4250	4500
Heidelberg Speed.	60	45	45	3000	3250	3500	4000
Heidelberg s/c	60	30	30	2500	2500	3000	3500
Komori s/c	45	25	30	2600	2600	3250	3600
HMT	120	60	45	2750	2750	3500	3800
Harris s/c	35	20	25	2400	2850	3500	3750
Harris small s/c	30	20	25	2500	3000	3750	4000

BINDING & FINISHING

Guillotine (normal pile height 75mm)

Single-knife

General cut/trim on basic guillotine	30 cuts per hour
General cut/trim on auto guillotine	60 cuts per hour
Repetitive cut on programmatic	120 cuts per hour
Trimming booklets head & tail	5 minutes per pile
Trimming booklets fore-edge	3 minutes per pile
Splitting into two (one cut)	10-12 piles per hour

Three-knife trimmer

Make-ready/set up	30 minutes
Hand-fed	250 piles per hour
Automatic	1250 piles per hour

Folding

Hand folding 1000 folds per hour

Machine folding

Set-up feeder	15 minutes
Make-ready 1 fold	20 minutes, 2 folds 30 minutes, 3 folds 45 minutes, 4 folds 60 minutes
Output speeds	
4 pages	4000 sheets per hour
6 or 8 pages	3000 sheets per hour
12 or 16 pages	2600 sheets per hour
24 or 32 pages	2300 sheets per hour

Machine collating

Make-ready	15-60 minutes
12 station gatherer	1500 sets per hour

BINDING & FINISHING continued

Hand insetting	1200 A4 items per hour
Hand inserting	1000 inserts per hour
Sewing machine	
Set-up	15 minutes
Auto-feed	5000-8000 sections per hour
Binding line	
Set-up	60 minutes
Gather, bind and 3-knife trim	1500-2000 books per hour
Perfect binding line	
Set-up	60 minutes
Gather, bind and 3-knife trim	1500-2000 books per hour
Gather and side -stab line	
Set-up	60 minutes
2 stitches	1500 books per hour
Laminating covers	
SRA2 (640 x 900mm)	1800 sheets per hour

PACKING

Parcels

10kg-12kg parcel

20 per hour

Shrinkwrapping

Set-up

10-12kg parcel

13-15kg parcel

APPENDIX B

COST CENTRES AND COST RATES

(Because of unforeseen delays, it has not been possible to calculate the actual cost rates. These will be calculated by Mr Padmananda Shrestha, upon his return from sick leave)

COST CENTRES AND COST RATES

	No. of operators	Weekly Budgeted hours	<u>COST RATE</u> Rs/hour
Pre-press			
Printing			
Sakurai 1c	3	72	
Komori perf	5	72	
Miller 2c/perf	5	72	
Heidelberg 2c/perf	5	72	
Heidelberg 1c	2	72	
Komori 1c	3	72	
HMT 1c	3	72	
HMT1c	3	72	
Harris 1c	3	72	
Harris 1c	3	72	
Harris 1c (small)	2	72	
Binding			
Shoei Folder	2	72	
Shoei Folder	2	72	
Shoei Folder	2	72	
Shoei Folder	2	72	
Shoei Folder	2	72	
Shupan	12	72	
Itoh	7	72	
Yoshino	7	72	
Yoshino	7	72	
Schneider	2	72	
Schneider	3	72	
Itotec	3	72	
New Line			
Shoei Folder		72	
Gatherer		72	
Sewing m/c 1		72	
Sewing m/c 2		72	
Binding line		72	
3-knife trimmer		72	
Lamination		72	
Shrinkwrap		72	

APPENDIX C

PLANT LIST AND SPECIFICATIONS

(These are to be checked, and revised as necessary, by Mr Subarna Pradhan)

PRE-PRESS

MACHINE	MIN. SIZE	MAX. SIZE	SPEED
BROWN HORIZONTAL CAMERA			
DAI NIPPON VERTICAL CAMERA		610 x 510	
DAI NIPPON PLATE PROCESSOR 860SG			
DAI NIPPON EXPOSURE FRAME			
AGFA DESK TOP SCANNER (MONO)		297 x 210	
APPLE LASER WRITER SELECT			
APPLE MAC QUADRA 650			
APPLE MAC CLASSIC II			

PRINTING

MACHINE	MIN. SIZE	MAX. SIZE	SPEED
SAKURAI SINGLE COLOUR 1/0		820 x 560	6-8000
KOMORI PERFECTOR 1/1		1035 x 745	7-8000
MILLER 2Col/PERF		920 x 650	5000
HEIDELBERG 2Col/PERF		1020 x 700	5000
HEIDELBERG SINGLE COLOUR 1/0		570 x 400	5000
KOMORI SINGLE COLOUR 1/0		700 x 500	5000
HMT SINGLE COLOUR 1/0		700 x 500	5000
HMT SINGLE COLOUR 1/0		700 x 500	5000
HARRIS SINGLE COLOUR 1/0		300 x 200	
HARRIS SINGLE COLOUR 1/0		300 x 200	
HARRIS SINGLE COLOUR 1/0		200 x 150	

BINDING

MACHINE	MIN. SIZE	MAX. SIZE	SPEED
SHOEI FOLDER		1030 x 890	6000
SHOEI FOLDER		1030 x 890	6000
SHOEI FOLDER		1030 x 890	6000
SHOEI FOLDER		1030 x 890	6000
SHOEI FOLDER		1030 x 890	6000
SHUPAN 12 STATION GATHER/BIND/3K			5000
ITOH 12 STATION GATHERER			
YOSHINO PERFECT BINDING LINE			
YOSHINO 12 STATION GATHER + SIDE STAB			
SCHNEIDER AUTOMATIC GUILLOTINE		1070	
SCHNEIDER AUTOMATIC GUILLOTINE		1070	
ITOTEC AUTOMATIC GUILLOTINE		1370	
NEW LINE			
SHOEI FOLDER			
GATHERER			
SEWING M/C 1			
SEWING M/C 2			
BINDING LINE			
3-KNIFE TRIMMER			
LAMINATION			
SHRINKWRAP			

TERMS OF REFERENCE

1. Visit JEMC from 13 March – 28 April 2000 in connection with the durable books pilot project and in continuation of the work done by you and by Kenneth Cowan in November – December 1999.
2. Continue with the introduction and training of JEMC staff to use a basic production management and control system which you have already identified and will take to Nepal. Ensure that any manual or guidelines are prepared and translated into Nepalese to enable JEMC to continue with the system.
3. Train JEMC staff to use a suitable costing and estimating system and leave them with guidelines in Nepalese to continue after your departure.
4. Train selected staff, as agreed with JEMC, to use the paper testing equipment which is being supplied. Ensure that instructions in Nepalese are available. Agree on a procedure for paper testing within JEMC as part of a management plan.
5. In the time available, train selected groups in general management areas, as necessary and as identified by you.
6. Prepare a brief report on activities, problems encountered and their solutions, outstanding concerns, next steps, and recommendations.