

NEPAL

**Basic and Primary Education Programme
Phase II**

Development of Durable Textbook Pilot Project

**Training of Bid Evaluation Committee and Book Production
Quality Control Systems for
Janak Education Materials Centre**

Kenneth Cowan

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1

INTRODUCTION

Janak Education Materials Centre (JEMC) was set up by the Ministry of Education in 1955 with the objective of providing teacher training materials. Moving to Sano Thimi in 1960, it became a public limited company, while still fully owned and controlled by the Ministry.

As a parastatal organisation, it has a monopoly for printing and distributing all core textbooks for grades 1-10 throughout Nepal, an average of around 12 million books per year. These books have a low life expectancy (3-12 months), and the MOE has agreed to produce durable books to a higher quality level on a trial basis for July 2000. These will cover grades 1-5 primary text books only, and will be produced for three areas: Jhapa, Kavhre Palanchok, and Darchula.

The consultant visited JEMC from 22 November – 16 December 1999 with three main objectives (See Annex G for Terms of Reference):

First, to establish JEMC's systems, methods of operation and current production quality levels;

Second, to help prepare JEMC for the preparation of durable books by specifying and assisting in the provision of suitable materials and equipment for their production;

Third, to prepare and install suitable quality control systems to ensure that quality improvements are maintained through all phases of production.

Abbreviations

BPEP	Basic and Primary Education Project
BPEDU	Basic and Primary Education Development Unit
CDC	Curriculum Development Centre
DANIDA	Danish International Development Association
DEO	District Education Office(r)
DOE	Department of Education
gm ²	grammes per square metre (paper and board weight)
IBD	International Book Development Ltd
JEMC	Janak Education Materials Centre
MOE	Ministry of Education
NR	Nepalese Rupees
PAT	Programme Advisory Team (Danida)
PPC	Primary Publishing Cell

Acknowledgements

To Erik, Vibeke, Santosh and the entire Programme Advisory Team who did so much to make us feel at home

To the management team at Janak who gave freely of their time, and who accepted me with good humour into their daily production meetings

In particular to Subarna Pradhan who called for me at the hotel faithfully each morning, and who patiently sought to answer my daily questions about operational methods at Janak

And finally to the school children of Nepal for their bright eyes and their future.

2 ASSESSMENT OF JEMC

2.1 Overview

With a staff of over 760 individuals, a bank of 12 offset presses, and 3 binding lines, JEMC is by far the largest printer in Nepal. The company operates on 3 shifts for printing, and one or two shifts for prepress and binding. Of the total staff, 509 are permanent and half of these are essentially administrative. This leaves some 250 staff actually involved in book production.

JEMC's mandate from the Ministry of Education (MOE) is to produce and distribute core textbooks for grades 1-10, sufficient to provide each pupil with their own book for each subject at the start of the school year. Delivery into the schools in sufficient quantities becomes a major issue each year, especially when many books do not reach some schools until 2-3 months after the start of the academic year in July.

Of the 12 million books produced annually, some 40% are supplied directly to private schools. Distribution is subcontracted to Sajha Publication who handle delivery of all textbooks to regional and district warehouses, agents and retail outlets. Given Nepal's rugged geography, and the difficulty in delivering books to many isolated schools, the problems of distribution alone have been the subject of separate studies.

2.2 Technical Quality Assessment of Grade I-V Textbooks

A battery of ten tests were applied to samples of all 19 current primary textbooks. These included tests for weight, thickness, whiteness, surface, and opacity of paper and cover materials, as well as binding quality. The results are listed in tabular form in Annex A.

The materials used, and the quality of printing and binding were very poor. It was evident that only the cheapest materials (paper, cover board and inks) had been obtained, and that quality was not a priority within the production process. It is worth noting that, while the standard format of the books was 210 x 160mm, no two books were trimmed to the same size and only one matched the standard format.

Most of the problems stemmed from the poor quality of the materials themselves.

The standard paper used was a 60gm² greyish paper made from mechanical pulp, supplied by two Nepalese papermills: Brikuti and Everest. That supplied by Brikuti was slightly superior in quality but both varied considerably from one sheet to another. More than one kind of paper was frequently used within the same book, but all were soft and highly absorbent giving a poor printing surface and a low tear resistance. Their only redeeming quality is good opacity since the grass fibres from which the papers are made are both bulky and unrefined.

The cover board is not much more than a thick paper (150gm²), tears easily, and provides little protection for the book. Since the book is secured by two metal side stitches, these tend to work their way through the soft cover causing it to detach from the book. The adhesive used is also of

variable quality and so does not always fully secure cover to book throughout the length of the spine.

Given that many books have already suffered some form of damage before pupils finally receive them in the schools, it is scarcely surprising that many last only a matter of months before falling apart. One 8-year old student in a hill-town school insisted that his book had lasted just 3 days. One hopes that this was an exception, since it was clear that many children take care to protect their books with plastic or even newspaper, which substantially extends their useful life.

2.3 Raw Materials

Almost half the total production budget is devoted to the purchase of raw materials (148 million Nepalese Rupees). So many of the textbook quality problems are related to poor materials, that sources of supply are central to any improvement.

Of the two mills who currently supply paper to JEMC, Brikuti has the better quality product. JEMC pay the lowest possible price for their 60gm² paper and the mill supplies an inconsistent and low quality as a result. A decision was taken to upgrade the textbook paper quality for grades 9 and 10 to 70gm² and the results were notably better.

A visit to the Brikuti Paper Mill in Bharatpur revealed a new meaning to the term ‘wood-free’. They prepare all their own paper pulp from subai grass (grown only at high altitudes), elephant grass, bagasse, rice husks and wheat straw. There is indeed not a single gramme of wood in any of their papers.

Set up with Chinese assistance in 1982/3 producing 50 tonnes per week, it now has a capacity of up to 500 tonnes per week, although market conditions mean that production is currently less than half capacity. The company was privatised in 1992, purchased a modern paper making unit from the UK, and claims to be able to supply high quality paper (at a price) by importing wood pulp. They have a fully equipped laboratory which appears to be in regular use.

The MoE is by far their largest client, and should put the Ministry into a strong negotiating position to secure better quality paper at a reasonable price. However it is evident that, while they claim to offer good quality paper, it would be unwise to make a contract for any substantial quantity until they have proved their point. The company runs at a loss on a bank loan of 7.8m NR, and suffers from frequent changes of management; any loss of the MoE account would possibly endanger their survival.

2.4 Current Plant and Capacity

Janak has a large plant which has grown (and contracted) over the years, as technology has changed, eliminating most large letterpress machines and the whole of typesetting. Workflow is reasonable between printing and binding, although distances from and to paper storage and the books warehouse are substantial.

Prepress is essentially pre-digital, and although they have a 7-year old Apple Mac Quadra and an old desk-top scanner, they are not able to take disks from the Primary Publishing Cell (PPC) to convert into film. This is currently handled by an outside agency. Text is shot on camera at Janak from hard copy supplied by the PPC, and then imposed by hand ready for plate making.

Although Janak's main function is producing textbooks, they also produce a range of other printed items. These include school exercise books (nearly 6,000,000 in 1997) on specialised line ruling machines, boarding cards and tickets for local airlines, and election ballot papers.

Three of the twelve single colour offset presses are comparatively modern and were installed with Japanese Assistance 1993-4. The rest are 20-30 years old and show their age by the number of break-downs and resultant low productivity achieved. The bindery shows a similar pattern with fairly recent (1994) Japanese folding machines and a binding line, alongside 20 year old gathering and binding machines. A full list of equipment is shown in Annex B, together with sheet sizes and speeds.

Casual observation suggests that, while speeds of 6,000-8,000 sheets per hour on the more recent presses may be technically correct, the frequency of machine stoppage probably reduces this to an average of 4-5,000 sheets per hour.

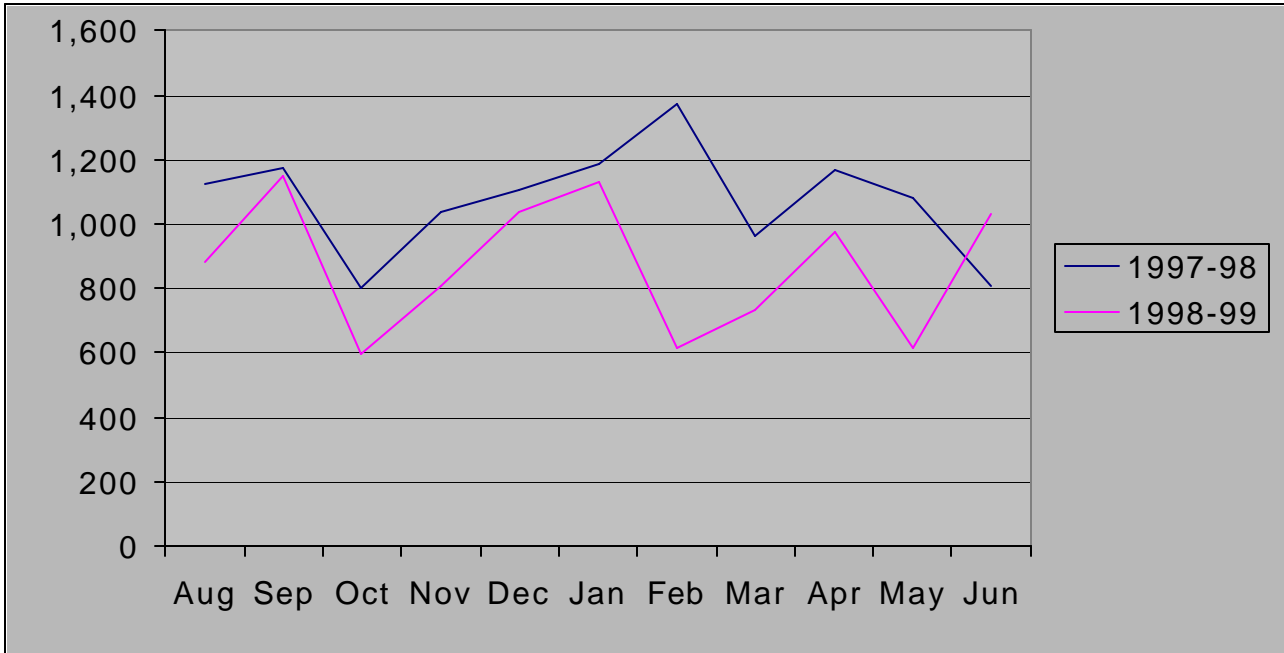
The bindery suffers from the same tendency. Five modern folding machines and an integrated binding line capable of producing 5-6,000 books per hour, are producing far less on average due to frequent stoppages. In particular, sheets which have irregular or wavy edges will not feed through the folders, and end up being hand-folded by a team of up to 40 women (with varying degrees of accuracy).

On a conservative calculation, this modern binding line produces some 8,000,000 books per year. The balance is produced on older binding lines making up the average annual production of 11-12 million books.

Based on an average 144 page textbook printed on Nepalese paper, the current plant has a total capacity of well over 15,000,000 books per year, although this level of output has never so far been achieved. It is certain that with higher quality materials in use, Janak's capacity would be even greater.

The graph below shows the total number of books produced over the same period of 11 months in 1997/8 and 1998/9 in '000's of books. The general pattern of production is remarkably similar in the two years, although spring, which should be the most intensive production period for the start of the school year in July, shows a fall-off accounted for by machine breakdowns and maintenance. The total number of books produced over the respective 11 month periods were

<i>1997-98</i>	<i>11,824,787</i>
<i>1998-99</i>	<i>9,583,192</i>



Janak Book Production (in 000's) in 1997/8 and 1998/9

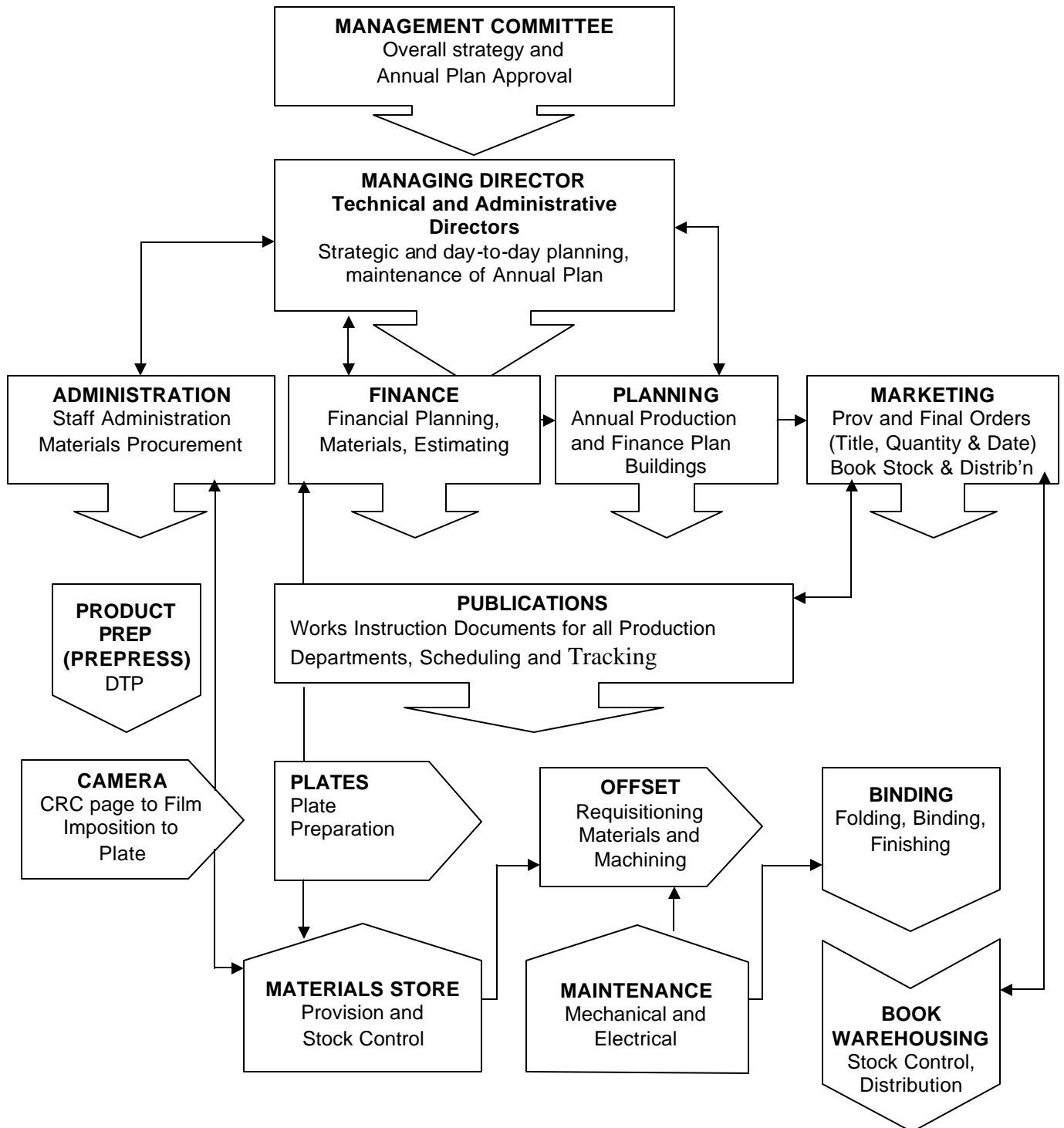
2.5 Management Systems and Methodology

The Janak management hierarchy is fairly clear.

The vertical structure vests authority in a Managing Committee, mostly drawn from the Ministry of Education, and expressed through the Managing Director and two Deputies. With information from four administrative departments (Administration, Finance, Planning, Marketing) orders are filtered through the Publications Department (essentially the Production Department) which prepares detailed 'job' sheets for each production department, and schedules and tracks all work through to the book warehouse.

Information flow however is far more complex, with constant exchanges of information in both directions between departments. This is best demonstrated in the diagram on the next page:

MANAGEMENT STRUCTURE AND INFORMATION FLOWS



There appear to be two (unstated) management objectives:

1. To operate within the budget set at the start of the financial year
2. To produce the maximum number of books required for the start of the school year (July)

The first is usually achieved without problems (see Annex C showing a complete Budget for 1998-1999).

The second is achieved rarely if ever. The reasons for this are bound up with the existing system, combined with a lack of management training at all levels, from managing director down to shop floor level. The reasons given for late (and very late) deliveries include:

- Late receipt of material from the PPC and the CDC
- Machine breakdowns, and delay in obtaining spare parts
- Machine maintenance problems, aggravated by bureaucratic delays within the system, which further delay the purchase of spare parts
- Poor quality materials causing further delays in production
- Distribution delays by Sajha Publication

2.5.1 The Current Management/Information System

While major policy decisions are taken by the Management Committee, the day-to-day running of the company rests with the Managing Director and his Deputies.

Representatives of each department meet with the directors every morning in a fairly informal 'any problems' **Production Meeting** which lasts 30-45 minutes. It deals with scheduling problems, machine breakdowns, visits to the plant by outside organisations, impending changes (the managing director left during the period of the consultancy for another state appointment). During the consultancy it dealt with concerns for quality control, and the introduction of specialised equipment and materials for the production of durable books. Decisions taken were then transmitted to other deputies and the 19 supervisors in each department concerned.

The **Order System** stems from the Marketing Department who collate the information required to calculate the quantities of each title and the delivery dates required. The Publications Department then prepares final **Works Orders** which are distributed to the relevant production departments who calculate their own materials requirements.

The supervisors file a **Daily Report** for each shift which are seen by the Directors, and then entered in a **Register Book**. A selection of this information is then entered on **computer** (department, shift, title, grade, quantity printed, balance remaining). Although the computers are ostensibly networked, it seems to have no other function than to act as a database for occasional

reference. No manager has a computer in his/her own office, nor would most of them know how to use it.

The other major document within the system is the **Paper Requisition Form** issued by the Offset Department to the Material Store for Paper, Board and Ink. The Material Store likewise keeps a very detailed **Stock Record** of every type of material issued (capital goods, spare parts, paper, cover board, ink, stationery, miscellaneous), although not necessarily related to individual titles. This makes any realistic calculation of paper spoilage highly problematic since there is no record of the amount of materials actually used on any single title. Again a summary is placed on the networked computer system, although for what purpose is unclear.

There is a pervading sense of the importance of keeping records in minute detail of all phases of production, and of all materials received and issued, not so much as a management tool but more as an essential hedge against future investigation.

2.5.2 A Possible Future Management System for Janak

Janak is expected to be self sufficient, and only receives payment from the government (at cost plus 5-7%) on delivery of books for distribution. It has to take out a bank loan (at favourable rates) in order to finance purchase of raw materials, pay for wages, electricity, insurance and all normal running costs.

Janak is not now, nor is it intended to be in the near future, a privatised company. It is not required to make profits, or to maximise efficiency or quality of production. It is frequently expected to take on yet more staff, when cold efficiency might dictate a 75% cut in staff.

In the shadow of this parastatal twilight, are we to say that a full-blown western-style management system is the best solution for a company that defies most of the rules of efficient management, and yet produces up to 12 million textbooks per year? The main functions and documents which would provide the tools of management control are:

- a) *Estimating* – At present, this is only done on a global basis for the annual financial plan, so that the estimated cost of any one title or book is approximate. A full estimating system would involve detailed figures for every title printed together with a realistic allowance for overhead costs.
- b) *Costing* – While global costs are known and recorded, there is no individual book costing system, and so little means of identifying where economies or wastage occurs. A detailed set of work dockets, time sheets and material requisitions would be needed to identify the real costs for each title
- c) *Works Orders* – These are issued by Publications, but leave much detail to the departments concerned (quantity of paper required, which printing machine etc). Ideally these would be prepared in detail leaving nothing to chance, and distributed to all relevant departments.
- d) *Time Dockets* – These do not exist for individual personnel, although Daily Reports do give an indication of the total time spent in each department on a given title.

- e) *Scheduling* – This exists only in rudimentary form. There is no visual system of forward planning by machine or by time period. Work is still processed on the basis of who shouts loudest goes first. A basic movable display of machine loadings for one or two months is simple to construct and easy to maintain, and would greatly enhance planning and scheduling.
- f) *Progressing* – The Daily Reports give an overall picture of progress within the plant, but again it is not a consistent function, more a form of fire-fighting. See comments under Scheduling.
- g) *Quality Control Systems* – A novel concept (see Chapter 4) apart from paper where some quality tests have been instituted. These have, however, not been used to improve paper quality, but rather to extract discounts from the paper supplier.
- h) *Daily Return of Materials Issued / Stock Record Sheets* – This system operates but would be more useful if it provided information on individual titles.
- i) *Spoilage Tickets* – These do not exist, but would normally be issued where paper and board allocated to a particular title has been spoiled, misprinted or damaged in binding. Observation suggests that spoilage is at least three times higher than would be acceptable in Europe, but no systems in operation provide hard evidence.

2.6 Management and Manpower Skills

As discussed above, even if systems were introduced into Janak to provide the tools of efficient management, there are no staff with the training to make use of them.

This is not to say that they lack qualifications. Several have university degrees in chemistry, engineering and electrical engineering, and are highly resourceful in solving many practical problems in the plant. But no one has specific management training, and only two members of staff have any outside technical training in printing at all. The Publications Department supplies some written methodology for production departments.

Given that most employees were local farmers and tradesmen before joining Janak, and have received their training ‘on the job’, it is scarcely surprising that quality standards and expectations are low.

Both management and technical training are required on a substantial scale, if Janak is to prepare itself for major improvements in quality and productivity. In addition, an outside manager with a background in European print would be required for at least 12 months to install management systems and to train relevant staff in their use.

The Ministry of Education's determination to proceed with a durable textbook pilot scheme involves a number of inter-related actions. In order for 840,000 books to be available for distribution in the three pilot areas by end June 2000, the following actions are required:

- Upgrading the book specification
- Specifying and inviting tenders for printing and binding raw materials
- Specifying and securing appropriate paper testing equipment
- Specifying and securing suitable digital pre-press equipment with relevant training
- Specifying and inviting tenders for suitable equipment for producing sewn books with relevant training
- Paper supply, storage and handling

3.1 Upgrading the Book Specification

Even with the most sophisticated methods of book manufacture, the present materials in use are too poor in quality to survive more than a year of active school use. For this reason alone, it was imperative to upgrade the text paper and cover material for books to last for a minimum of three years.

As a result, a 70gm² good quality woodfree white offset paper has been chosen for the text, and a one-side coated white board of 280gm² for the cover (almost twice the weight of the current cover material). Although the pilot scheme involves no colour (apart from the 2-colour covers) these materials will react well with colour inks when the decision is taken to move into colour from black and white text.

Another major change will be the introduction of the first automatic sewing machine to be used in Nepal. This will revolutionise the binding of text books, allowing them to lie flat on the desk, and avoid the tendency for the current metal staples to damage and eventually detach the book cover.

Finally, covers will be laminated with thin adhesive film, giving them a high degree of strength and protection.

A detailed book specification can be found in Annex C.

3.2 Raw Material Tenders

A highly detailed specification was prepared for all printing and binding materials required for the durable books pilot scheme.

The items for tender were:

- TEXTPAPER White wood-free offset cartridge 70gm2
- COVER BOARD Bleached white board 280gm2
- LAMINATION Plastic laminate on rolls 12 micron
- ADHESIVE Hot-melt flexible PVA
- THREAD Strong white poly-cotton
- SHRINKWRAP Polythene film 15 micron
- INK High density black ink

A Technical Evaluation Team was appointed at JEMC consisting of the following members:

Mr Ramesh Nath Joshi	<i>Acting General Manager</i>
Mr Subarna M Pradhan	<i>Director of Publications</i>
Mr Panna Ratna Shakya	<i>Assistant Director of Publications</i>
Mr Subodha Kumar Shetha	<i>Finance</i>

The consultant gave full briefings for each stage of the evaluation, including methods of calculation and final scoring. Samples of the evaluation forms and marking systems used are shown in Annex E.

Two bids were received from suppliers based in Kathmandu: *Trade Link International* and *Kagus Kothi*. The evaluation was carried out at the offices of PAT in Keshar Mahal, Kathmandu over a period of two days on 15 and 17 December, supervised by Santosh Khattri of the BPEP/PAT Advisory Team.

3.3 Paper Testing Equipment

Given the difficulty of identifying paper of the correct quality to achieve good durable textbooks, JEMC requested suitable testing equipment to ensure that high standards of text-paper could be maintained.

The proposed items for purchase were as follows:

- QUADRANT SCALES portable scales to measure paper and board weight
- DIAL MICROMETER for measuring paper and board thickness
- TEAR STRENGTH TESTER for measuring paper and board strength
- SPECTROPHOTOMETER for measuring whiteness, brightness, opacity, colour
- DENSOMETER for measuring porosity and absorbency of paper

These items, some of which are highly specialised for the paper trade, were subsequently selected from offers received by IBD. Detailed training is needed on the spectrophotometer and will be available from the IBD printing consultant who will also give training in the use of the other items.

3.4 Digital Prepress Equipment, Software and Location

Currently Janak has little up-to-date digital equipment and is not able to accept most book material on disk from the Primary Publishing Cell.

High quality durable textbooks will require suitable digital preparation for accuracy and speed of production. An added advantage will be that, when the decision is taken to move primary textbooks into full colour, the prepress equipment proposed will already be colour compatible and should not require immediate further purchases of equipment.

A suitable location at Janak has already been identified for the installation of a prepress department, currently used as a store room. The floor area is 4.5 x 7.0 m. It will require clearing, repainting, adding a false ceiling at approx. 2.8m height with suitable lighting, a basic air conditioning system, and a double door entry system to exclude dust and rapid changes of temperature. The suppliers of the digital equipment will have to advise on cabling and consistency of power supply.

The equipment proposed for local tender was as follows:

- 2 AppleMac Computers with Microsoft Office and graphics software compatible with that in use at the PPC
- 1 Imagesetter with film processor
- 1 Server
- 1 A3 Colour Scanner
- 1 A3 Colour Printer

Linked with this new graphics capability, the PPC is being encouraged to produce new integrated designs for the covers of all grade five primary grade text books in time for the durable book pilot project. These will be in 2 colours (as at present) but will make greater use of the existing software and design training, providing a style which will link all the textbooks for each year.

3.5 Durable Textbook Binding Equipment

Upgrading the materials is an essential part of ensuring the length of book-life required; the second upgrade concerns the method of binding.

All books are currently metal side stabbed. This ensures that pages do not become detached, apart from the first and last pages in the book. Unfortunately it also guarantees that the soft covers will detach as the metal stitches rub through the cover in use, and makes it impossible for the student to open the book flat. The introduction of sewing capacity ensures that both these short-comings will be overcome, improving overall usability as well as a longer life. A complete set of modern binding equipment is proposed which can handle the durable textbook pilot quantities with speed and efficiency.

Handling is a major area of concern, from paper supplier to book delivery into the classroom.

Folded sections of 100 sections or more are frequently tightly strapped together without using wooden end boards. The straps cut into the first and last few sections causing unacceptable wastage. It should be a firm principle that :

- a) sections should only be strapped using wooden end boards
- b) the end boards are useless if they are smaller than the folded sections – they should be at least 5-10mm larger than the sections themselves
- c) adequate stocks of end boards should be kept to ensure that they are always available, whatever the volume of sections being processed

The same considerations apply to bound and trimmed books, which suffer from strapping in exactly the same way, resulting in damaged books leaving the plant. For this reason, shrink-wrapping is proposed as an alternative wrapping method and a shrink-wrapping machine is included in the list of equipment to be supplied (see list below). This does not damage the books, and protects them from dust and damp.

Shrink-wrapping the books, however, does not protect them from poor handling between leaving JEMC and final delivery to the schools. All the evidence points to further damage to the books during distribution due to poor handling. The best solution to this problem lies in the use of double-walled cartons manufactured to the correct size for a specific quantity of textbooks – say 50 or 100 – to a maximum of 15kg weight. Quantities of at least 5,000 cartons should be economic, and given that the higher costs of durable primary textbooks, the investment in cartons should more than pay for itself.

The items included in the binding equipment bid were as follows:

- 1 Folder
- 1 Gatherer
- 1 Sewer (subsequently increased to 2)
- 1 Binding Line
- 1 Three Knife Trimmer
- 1 Laminator (for covers)
- 1 Shrink Wrapper (for finished books)

3.6 Paper Supply, Storage and Handling

The methods used for handling paper from paper mill to printing press leave much to chance, and result in wastage and lost production time.

Given the poor and inconsistent quality of paper supplied, the paper and board are not precision trimmed at the mill. 1500 sheets at a time are packed in paper and sewn up in woven plastic bags. These are delivered by truck, but without pallets, and manhandled onto manual forklifts for transfer into the paper warehouse at JEMC.

The packs are then piled up directly on the concrete floor (or sometimes on slender metal pallets which have buckled under the weight) to a height of 5-8 metres. This results in piles

overlapping, piles of different heights being used as stepping stones by warehouse staff to access the top parcels, parcels breaking open as they are passed down by hand, and other damage occurring before the paper even reaches the press. As a result, the paper frequently has wavy or torn edges, causing delays on press and in the bindery.

Four actions are required if durable textbooks are to be produced to a good quality standard:

- 1 All paper and board supplied should be *precision-cut* at the mill, and packed to export standards in such a way as to avoid dust, damp and the rigours of normal handling in transit (specified in detail in the bid documents for raw materials).
- 2 On arrival, all parcels should be transferred onto *wooden pallets* of approximately 800 x 1,000mm.
- 3 The warehouse needs to be equipped with *racking* sufficient to accommodate the 192 tonnes of text-paper, and 32 tonnes of cover board. The racking should be constructed of rolled steel sections to a maximum height of 5 metres, depending on the load bearing capacity of the concrete floor, and the space available for racking. Paper should only be stored on wooden pallets on the racks, and only moved by forklift truck.
- 4 A *forklift truck* should be purchased capable of handling fully loaded pallets on racks up to 5m high.

The key to all paper handling is the wooden pallet. Essentially good quality paper should be moved only on pallets by forklift truck to ensure that sheets reach the printing press in the same condition that they left the paper mill.

4 QUALITY CONTROL – A CONCEPT

4.1 Current Practice

Quality, as already mentioned elsewhere in this report, is not part of the company ethos at JEMC. While tests on paper are made in-house and to a greater depth by an independent testing agency in India, there is no system of control with the aim of improving or even maintaining quality levels.

At present there is no motivation to improve quality when materials are poor, and there is no incentive to achieve better results. The preparation for durable textbooks presents an opportunity for staff members to feel more involved in a new project with modern machines and good paper and board.

4.2 An Integrated Quality Control System

The key to a new system is the person who takes responsibility for introducing it, for motivating staff to adopt the system, and ensuring that it develops. There is no doubt that Mr Subarna M Pradhan, Head of Publications, is highly qualified for the job. He is a trained chemist, and is already responsible for the quality of materials used, even if only as a means of extracting discounts from the paper mills. He is also conscientious and seems to relate well with other staff members. Mr Pradhan has agreed to take on the job, although there are no real incentives for him to do so, apart possibly for some training outside Nepal.

As preparation for the introduction of the system, separate meetings were held by the consultant with all supervisors from three departments: camera, offset and bindery – some 19 people in total.

The meetings were held with the intention of introducing the concept of quality control as ‘not so much a system, more a state of mind’. As the sessions progressed, it was apparent that supervisors had come prepared for a lecture on quality standards. Then an outline of the durable book pilot scheme was discussed with details of the new machinery (bindery supervisors were suddenly interested) and materials. They were astonished to be congratulated on producing 12 million books per year, and even more to be asked what kinds of problems they experienced on a daily basis.

With the prospect of new machines and better paper, the concept of quality standards took on a more positive aspect and a good dialogue developed. Staff had become so used to handling machinery and systems from which quality was not an expected outcome, that the idea of a genuine fresh start was motivation in itself, and the sessions sprang to life.

The idea of training in quality control systems at a printer in Singapore, Hong Kong or elsewhere, was also a welcome idea, and an essential one to the success of the system.

The details are shown in Annex F.

The essential points of the quality control system are the following:

- A sheet of quality control points (see Annex F) is distributed to each department to show that all production units are involved.
- Each department is asked to prepare their own standards, together with systems for monitoring them.
- A meeting is set up with each department to discuss the standards proposed and to prepare a final version.
- Mr Pradhan to do random physical checks to see that standards are being observed.
- Fortnightly meetings with all supervisors to discuss quality problems and solutions, all to be recorded on a quality Control Record Sheet (see Annex F).

JEMC is a substantial printing plant by any standards, and a giant in Nepalese terms. It has a wide range of equipment, much of it outdated although a significant proportion is only 6 years old and has a high production capability. Despite the severe limitations placed upon JEMC as a parastatal company, it still succeeds in producing 11-12 million textbooks per year.

Its essential weaknesses stem from a lack of management expertise, poor motivation, heavy overmanning, and poor quality product due to the purchase of the cheapest materials available. The pilot project for durable textbooks is an attempt to address the latter problem, but in due course the others must be dealt with if the company is to develop and maintain an efficient level of production.

Although dealt with in outline form in this report, a detailed analysis of the current management system will be carried out as part of a separate mission.

A summary of the main proposals follows.

Management Systems

Introduce basic systems (initially manual) to control

- Real costs and spoilage rates
- Scheduling and progress
- Production quality (see Annex F)

Production Systems

- Upgrading the book specification (see Annex C)
- Installation of a modern digital prepress unit
- Installation of a modern sewn binding line (with special training on the sewing machines)
- Acquiring and using paper testing equipment to establish and maintain good paper and board quality
- Introducing wooden pallets for handling all paper, printed sheets, folded sections and finished books
- Introducing correctly sized wooden end-boards for all folded sections
- Introducing wooden pallets, modern rolled steel racking and a suitable 3-5m forklift truck for the paper warehouse
- Examining the use of double walled cartons for packing finished books for distribution

Training

- Management training for senior personnel, either by bringing in an experienced manager for 6-12 months who would establish systems and train personnel in their use, or by sending them to a printer outside Nepal for a 4 week period

- Technical training for heads of department for 3-4 weeks at a printer or printing college outside Nepal
- Quality Control System training for Supervisors at a printer, preferably in Singapore.

6 NEXT STEPS

- 1 Follow-up to establish progress in introducing the quality control systems proposed in December 1999 and to help integrate them with a future management system.
- 2 Follow-up to check the correct installation of paper storage systems, prepress digital unit, and bindery and handling systems and to check that staff training has been successfully carried out.
- 3 Follow-up to check the technical quality of the durable textbooks produced.

ANNEX A

NEPAL TECHNICAL EVALUATION GRADES 1- 5 : December 1999

Title	MATHS 1	NEPALI 1	SEROFERO 1	MATHS 2	NEPALI 2	SEROFERO 2
Format (mm)	212x157	215X162	204X156	197X156	199X154	210X157
Extent (pages)	112	112	80	144	152	128
TEXT PAPER <i>mechanical</i>						
Weight 60gm2	60	66	60	60	64	65
Bulk 80-90 micron	90	100	100	100	90	100
'Natural White'	Poor	P	P	P	P	P
Surface	Poor	P	P	P	P	P
Opacity	OK	OK	OK	OK	OK	OK
COVER BOARD						
Weight 150gm2	150	140	140	148	164	160
Bulk	200	200	200	200	220	220
Whiteness	Poor	P	P	P	P	P
Surface	Poor	P	P	P	P	P
BINDING <i>side-stitched,</i>						
Gluing	average	average	Very poor	OK	Very poor	Very poor

Title	MATHS 3	NEPALI 3	SEROFERO 3	MATHS 4	NEPALI 4	ENVIRONM'T 4
Format (mm)	213x158	210X160	203X158	206X154	200X153	196X152
Extent (pages)	152	160	144	176	144	144
TEXT PAPER <i>mechanical</i>	mixed papers	mixed papers			mixed papers	mixed papers
Weight 60gm ²	60	64	62	60	63	58
Bulk 80-90 micron	80	100	90	100	90	80
'Natural White'	Poor	P	P	P	P	P
Surface	Poor	P	P	P	P	P
Opacity	OK	OK	OK	OK	OK	OK
COVER BOARD						
Weight 150gm ²	148	150	150	156	150	140
Bulk 165-180 micron	220	220	220	200	220	200
Whiteness	Poor	P	P	P	P	P
Surface	Poor	P	P	P	P	P
BINDING <i>side-stitched, limp</i>						
Gluing	Very Poor	Very Poor	Very Poor	Average	Average	Average

Title	COUNTRY 4	ENGLISH 4	COUNTRY 5	MATHS 5	NEPALI 5	ENVIRONM'T 5	ENGLISH 5
Format (mm)	205x158	208X158	210X156	212X158	200X156	208X160	210X160
Extent (pages)	136	144	152	176	176	152	184
TEXT PAPER <i>mechanical</i>	mixed papers	mixed papers		mixed papers	mixed papers	mixed papers	mixed papers
Weight 60gm2	58	60	62	62	60	64	64
Bulk 80-90 micron	80	90	100	90	100	100	95
'Natural White'	Poor	P	P	P	P	P	P
Surface	Poor	P	P	P	P	P	P
Opacity	OK	OK	OK	OK	OK	OK	OK
COVER BOARD							
Weight 150gm2	144	148	152	136	152	160	150
Bulk 165-180 micron	210	210	200	200	220	210	200
Whiteness	Poor	P	P	P	P	P	P
Surface	Poor	P	P	P	P	P	P
BINDING <i>side-stitched, limp</i>							
Gluing	Average	Average	Poor	Average	OK	Poor	Poor

CURRENT PLANT AT JANAK AS AT DECEMBER 1999

Date	Manufacturer	Item	Size (mm)	Speed (iph)
		PREPRESS		
1967	Brown	Horizontal Camera		
1994	Dai Nippon	Vertical Camera	610 x 510	
1994	Dai Nippon	Plate Processor 860SG		
1994	Dai Nippon	Exposure Frame		
1993	Agfa	Desk Top Scanner (mono)	210 x 297	
1992	Apple	Laser Writer Select		
1993	AppleMac	Quadra 650 with Word 5, Photoshop 2.5.1, Pagemaker, Freehand		
1988	AppleMac	Classic II (mono)		
		OFFSET		
1994	Sakurai	Single colour 1/0	820 x 560	6-8,000
1994	Komori	Perfector 1/1	1035 x 745	7-8,000
1994	Komori	Perfector 1/1	1035 x 745	7-8,000
1981	Miller	1/1 or 2/0	920 x 650	5,000
1981	Heidelberg*	Speedmaster 1/ 1 or 2/0	1020 x 700	5,000
1967	Heidelberg*	Single colour 1/0	570 x 400	5,000
1981	Komori	Single colour 1/0	700 x 500	5,000
1991	HMT (India)	Single colour 1/0	700 x 500	5,000
1991	HMT (India)	Single colour 1/0	700 x 500	5,000
1967	Harris	Single colour 1/0	300 x 200	
1967	Harris	Single colour 1/0	300 x 200	
1963	Harris	Single colour 1/0	200 150	
		BINDERY		
1994	Shoei	5 Knife & Buckle Folders	1030 x 890	6,000
1994	Shupan	12 stn gatherer,binder+3KT		5,000
1982	Itoh	12 stn gatherer		
1981	Yoshino*	Perfect binding line		
?	Yoshino	12 stn gatherer + side stab		

Date	Manufacturer	Item	Size (mm)	Speed (iph)
		<i>BINDERY (concluded)</i>		
1982	Schneider	Guillotine automatic	1070	
1984	Schneider	Guillotine automatic	1070	
1994	Itotec	Guillotine automatic	1370	

** These machines were out of operation (mostly for lack of spare parts) at the time this list was compiled*

JEMC ANNUAL BUDGET 1998-99**Capital Investment Budget (in Nepalese Rupees)**

Item	Budget	Actual
Capital	3,000,000	-
Buildings	7,150,000	4,141,204
Machinery	6,520,000	99,920
Electrical Installations	200,000	368,425
Office Furniture	400,000	230,828
Vehicles	3,273,000	2,259,150
Office Equipment	570,000	281,507
Library	50,000	21,966
Tools	600,000	71,838
TOTAL	21,763, 000	7,474,807

Production Budget 1998-99 (in Nepalese Rupees)

Item	Budget	Actual
Paper	148,382,849	113,821,024
Ink, Chemicals	4,000,000	2,151,438
Miscellaneous	600,000	4,743,345
Spare Parts	4,000,000	1,925,570
Salaries, Wages	32,500,000	29,338,211
Provident Fund	2,400,000	2,136,958
Store Account allowance	249,893	242,813
Medical allowance	3,410,000	3,061,353
Overtime	3,528,001	3,633,643
Production Service allow	9,000,000	8,040,445
Tiffin allowance	3,500,000	2,473,273
Cloth allowance	2,689,339	2,654,379
Staff Insurance	1,600,000	395,658
Games	55,000	9,100
Holiday compensation	1,100,000	1,019,173
Mail and telephone	600,000	652,859
Stationery	600,000	701,415
Electricity and water	3,300,000	2,649,623
Fuel	3,000,000	3,129,815
Vehicle maintenance	1,497,752	1,860,628
Transport	165,000	178,897
Building maintenance	710,251	690,417
Machine maintenance	500,000	973,454
Miscellaneous	300,000	485,978
Travel allowance	700,000	1,016,276
Reception	249,733	300,004
Trade promotions	165,000	114,936
Sales commission	60,000,000	51,727,316
Practical assistance	743,000	698,470
Taxes	2,500,000	236,518
Training	800,000	251,994
<i>unidentified</i>	182,000	241,010
<i>unidentified</i>	2,050,000	2,050,000
<i>unidentified</i>	400,000	438,800
Auditing	100,000	50,000
Advertising and publicity	1,100,000	1,163,183
Newspapers	200,000	174,822
Bank interest	10,000,000	14,760,841
Plant / Buildings insurance	1,310,000	1,095,637
External printing (outwork)	770,000	92,861

Transportation (cooli)	1,800,000	1,249,000
<i>unidentified</i>	316,000	248,510
<i>unidentified</i>	333,132	300,192
Packing	1,000,000	653,949
<i>unidentified</i>	2,500,000	-
Miscellaneous	625,000	1,283,145
Scholarship	115,800	100,800
Staff welfare	50,000	51,000
TOTAL	321,104,752	245,264,630

TECHNICAL SPECIFICATIONS FOR DURABLE BOOKS

TEXT PAPER

White woodfree offset cartridge

Weight	70 gm ²
Bulk	90-110 microns
Brightness	83%
Whiteness	135 CIE
Opacity	88%
Porosity	160 Bendtsen
Break Strength	60N long, 27N cross

COVER BOARD

Fully bleached white board, made from minimum 70% chemical pulp, coated and calendered one side only.

Weight	280 gm ²
Bulk	330-360 microns
Brightness	88%
Whiteness	98 CIE D65
Smoothness	Top-side 15, Wire-side 350 (Bendtsen)
Rigidity	MD 15, CD 7 (Taber)
Grain	parallel to book spine
Finishing	4 scores to allow 6mm hinges back and front, laminated

BINDING

Style	Section folded and thread sewn
Cover	Drawn on and fully glued to spine and front and back hinges, using high quality PVA adhesive
Finishing	Laminate cover and trim flush

EVALUATION DOCUMENTS FOR RAW MATERIAL BIDS

BID OPENING 15.30 TUESDAY 14 DECEMBER

1

Detailed technical evaluation

Samples supplied for each item

Packing details

Warranty and guarantees

2

Delivery schedule

3

Price schedule

MERIT POINT SYSTEM

Technical Specification compliance	35 points*
Delivery Schedule	15 points
Price	50 points

**** any bidder scoring less than 25 points on technical specifications is disqualified***

TECHNICAL EVALUATION SCORE SHEET

Bidder

ITEM	Specification	Bidder's Spec	Comment	Points
TEXT PAPER				
Woodfree				
Calendered 2 sides				
Sheet Size	660 x 890 mm			None
Sheet Quantity	4,666,000			None
Total Weight	192 tonnes			None
Base weight	70 gm2			
Bulk	90-110 microns			
Brightness	83%			
Whiteness	135 CIE			
Opacity	88%			
Porosity	160 Bendtsen			
Break Strength	60Nlong 27Ncross			
Packing	See specs			
COVER BOARD				
Bleached board				
Min 70% chem plp				
Coated 1 side only				
Sheet Size	460 x 690 mm			None
Sheet Quantity	279,000			None
Total Weight	25 tonnes			None
Base Weight	280 gm2			
Bulk	330-360 microns			

Brightness	88%			
Whiteness	98 CIE D65			
Smoothness	Top15, verso 350			
Rigidity	MD15 CD7 Taber			
Packing	See specs			
LAMINATION				
Plastic laminate				None
Total area	113,500 m2			None
Thickness	12 micron			
Reel width	To be advised			None
ADHESIVE				
Hot melt PVA				
Total weight	2,000 kg			None
Temperature range	-10C to 45C			
THREAD				
White Polycotton				
Total Quantity	2,000,000 m			None
Length per reel	100 m			None
No of reels	20,000			None
SHRINK WRAP				
Polyethylene film				
Total area	17,000 m2			None
Thickness	15 micron			
Length per reel	750 m			None
Reel width	To be advised			None

INK				
High density black				
Total weight	715 kg			None
Weight per tin	Not specified			None
Density	1.75 – 1.95			
Tack resistance	14.5 Bettertech			
Light Fastness	8 blue wool scale			
			TOTAL POINTS (max 30)	

COST EVALUATION SCORE SHEET

Evaluation Method

Lowest price (**lp**) divided by price of bid under consideration (**bp**) times 100 to give %

$$\frac{\text{lp}}{\text{bp}} \times 100 = \%$$

Then convert to relevant proportion of 50% points allocated to price.

Bidder	Initial %	points out of 50%
A		
B		
C		
D		
E		
F		
G		

Comments:

DELIVERY SCHEDULE SCORE SHEET

Evaluation Method

Assuming: Earliest Date for receipt of goods is 1 March
 Latest Date “ “ 1 May
 Best Offer Date (**BOD**) “ “ 15 March - 14 elapsed days (**ed**)
 Current Offer Date (**COD**) “ “ 22 April - 52 elapsed days (**ed**)

Then $\frac{\text{BODed} \times 100}{\text{CODed}} = \% \text{ points}$

In the above example, $\frac{14}{52} \times 100 = 27\%$

The final % should then be converted to a proportion of the 15 marks allocated to the delivery schedule.

Bidder	Initial %	points out of 15%
A		
B		
C		
E		
F		

Comments:

FINAL SCORE SHEET

Evaluation	Bidder A	Bidder B	Bidder C
TECHNICAL (35%)			
DELIVERY (15%)			
PRICE (50%)			
TOTAL MARKS			

On the basis of the above evaluation, we propose that

Bidder

be given the contract for *Printing and Binding Raw Materials*.

Signed by the members of the JEMC Technical Evaluation Committee:

17 December 1999

Production Quality Control System

'Quality Control is not only a system, it is a state of mind'

PREPRESS

Set written standards for each phase of film and plate preparation and ensure that these are monitored accurately on a daily basis, especially chemicals used for developing and fixing film and plates, and power and intensity of the light source in the exposure frame, and efficiency of vacuum.

- a) **Check CRC for quality, consistency and any corrections required**
- b) **Check film for correct exposure, using a grey scale**
- c) **Check imposed film for scratches, marks, stains, and correct imposition sequence and squareness**
- d) **Check plate for correct exposure and development – all text and illustrations to be crisp and clear**

OFFSET

Set written standards for quality of pass sheets to be signed off by supervisors i.e. clean sheets, correctly inked, all pages correctly positioned and square to the sheet edge so that when perfected, each page drops precisely on the back of the first

- a) **Check plates for blemishes and obvious errors (eg. film transposed left to right)**
- b) **Establish a machine pass sheet signed by the supervisor**
- c) **Check every 100-200 sheets against pass sheet – reject scum sheets, poor ink density, creasing**
- d) **Check second side against the first for consistency in ink density**
- e) **Check quality of 2-colour printed covers**
- f) **Check correct application of lamination without dust or bubbles or any signs of delamination**
- g) **Ensuring that there are sufficient waste paper containers to avoid materials being thrown on the floor**

BINDING

Set written standards for quality and accuracy of folded and gathered sections, side and saddle stitching and eventually thread sewing, covering and trimming. Ensure regular monitoring of standards set.

- a) **Check folding for squareness, correct crossovers if any**

- b) Check that no sections or books are bundled and strapped without using wooden boards (cut slightly larger than the untrimmed book format) at either end, to avoid damage to first and last sections or books
- c) Check gathering for correct sequence
- d) Check book blocks for appropriate binding method
- e) Where side or saddle stitched, wire staples to be straight and to meet neatly without being too short or overlapping
- f) Check sewing, 4 stitches equally spaced
- g) Check covering and 3 knife trimming
- h) Check finished book, square, with clean cut edges (no tearing on cover)
- i) Ensuring that there are sufficient waste paper containers to avoid materials being thrown onto the floor

PACKING (for durable books experiment)

Set written standards for number of books per shrink-wrapped parcel (25, 50 etc), and per double-walled corrugated carton (100) if used, method of sealing cartons, and tension on outer strapping. Prepare pre-printed labels with title, grade, quantity etc for use on outside of cartons.

Under no circumstances should loaded cartons be dropped or thrown, especially on corners or edges which are the most vulnerable points.

1. PAPER

All quality paper and board delivered to JANAK will have to be stored on purpose-built racks using wooden pallets and fork-lift trucks, to reduce manhandling reams of paper to a minimum

2. MEETINGS WITH SUPERVISORS

Meetings should be held with Offset and Bindery supervisors fortnightly, supervised by Subarna Pradhan, to monitor:

- That written standards have been set and are workable
- That these standards are being maintained, and if not, what can be done to help maintain them
- To examine individual books which fall below the standards which have been agreed, and to discuss ways of avoiding the same fault in the future

See Quality Control Record Sheet on next page

QUALITY CONTROL RECORD SHEET

Meeting Date.....

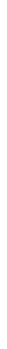
PROBLEM

SOLUTION

PREPRESS



PRESS



POSTPRESS



TERMS OF REFERENCE

1. To work with the Janak Education Materials Centre (JEMC) in Sano Thimi, to assess their present capacity, equipment, methodology, systems, quality, manpower skills and management
2. To introduce into JEMC basic production quality control systems
3. To train the bid evaluation committee to assess the tenders for raw materials, and to assist with the ‘international and local shopping’ invitations to provide pre-press and paper testing equipment.
4. Assist as possible with evaluation of bids and proposals from potential suppliers adhering as closely as possible to DANIDA procurement regulations.
5. Report on activities, findings, conclusions, recommendations and next steps.