UNIT 7 PAPER - HISTORY, TYPES AND SELECTION

Structure

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7.0 AIMS

The main aim of this unit is to familiarize you with paper—the main constituent of a physical book. Paper constitutes the major publishing cost of a book. It is, therefore, essential for a production person to know the varieties of paper, its qualities and selection. The calculation of paper will eliminate wastage in paper and economize the production cost. After going through the unit, you will be able to calculate the quantities required for a particular edition of the book and distinguish between one kind of paper from another.

7.1 INTRODUCTION

The knowledge of paper, its varieties, its qualities and selection plays a significant role in the production of a book. Paper also contributes to the cost of a book in a big way. This unit, therefore, has been designed to unfold various aspects of paper and related areas. Starting with a brief history, its making process, the materials required for making paper, the unit also gives information on various sizes in which paper is available and the formula for the calculation of paper, which is of great importance for a production person.

The calculations of quantities and weight have been explained with examples for easy understanding.

7.2 PAPER DEFINED

The word 'paper' is derived from the Greek word 'papyrus', an early Egyptian writing material extracted from the papyrus plant. Paper is a material derived from wood, cloth, grass, or any other cellulose material which can be separated into its
constituent fibers, turned into pulp and manufactured into sheets (for such end purposes as printing, writing and wrapping).

It can also be defined as ‘A web composed of vegetable fibers, roughly oriented and matted together so as to form a sheet’.

Though the technology of paper making may not be within the scope of this book, yet a brief outline of the story of paper and its process may help you to appreciate the craft and help in distinguishing varieties of paper and their qualities.

7.3 BRIEF HISTORY

Paper making is an ancient craft. The writing on clay tablets and wooden strips was a very slow and cumbersome process. Earlier, fabric, particularly silk, was used as a medium for writing. It is generally believed that Ts'ai Lun, a Chinese, invented paper around 105 A.D. The raw material used for paper making was old rags, hemp waste and bark of trees.

The invention of making ink from lamp black brought paper into further prominence and universal use. The art of paper making traveled from China to Japan and later to the Middle East and Europe.

The invention of movable type by Gutenberg of Mainz brought about a revolution in the art of printing. The Renaissance era in Europe created a great demand for paper and paper mills were established in Europe.

The craft of paper making is said to have come to India through the Middle East but there are certain evidences which show that even before 15th century, paper was in use in India. Palm leaf was commonly in use for writing. During the early days of the British settlement, paper was imported from England. In the beginning of the 18th century, a paper mill was established in India.

Activity 1

How would you define paper?

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(Check your answer with that given at the end of the unit)

7.4 RAW MATERIALS

The process of paper making can be explained as the addition of water to wood pulp, which is then passed through machines which progressively extract water and dry the moving ‘web’ of paper, at the same time causing separate fibers in the pulp to unite, giving strength to the paper.

The explanation given in the above paragraph may lead you to believe that wood is the only raw material needed for making paper. This is only half true. A variety of raw materials is available and used for making paper of different strength, smoothness and surface.
The raw materials, commonly used for making paper can be enumerated as follows:

7.4.1 Vegetable Cellulose

The basic raw material of paper is carbohydrate cellulose produced by vegetables. Natural cellulose fibers which are available in many vegetables and plants are extracted by mechanical or chemical means. The amount of chemical action in extracting the cellulose from other organic substances decreases the durability of paper. Of the possible sources of cellulose fibers, more important are wood, cotton, bamboo, grass, straw. The quality of paper depends upon the quality of the fibers used in the process of paper making.

7.4.2 Rags or Cotton

Cotton fiber is the longest and with minimum of impurities. But as rags it accumulates a large number of impurities. Even as rags it is capable of becoming the raw material for superior quality of paper because of quality of cellulose.

7.4.3 Esparto grass

Esparto grass is also used as a basic component together with wood pulp for making very superior quality of paper. Esparto paper with special coating and finish is ideal for picture magazines. The surface of esparto paper depends upon the finish, sizing or calendaring.

7.4.4 Wood

Natural wood is another basic ingredient of paper making. Wood paper is made from soft as well as hard wood. Soft wood papers are stronger as against papers made from hard wood as soft wood contains longer fibers and hard wood yields short fibers.

Normally, wood papers are brittle and can be easily torn. Though wood is a natural product, due to its indiscriminate use for paper making and other works of civil development, this natural resource is fast depleting and becoming scarce.

7.4.5 Paper Waste or Broke

Fast depleting natural raw materials have compelled us to look for alternatives to serve as substituted input for paper making. The process of recycling paper waste into paper has come as an alternative to natural fibers.

The paper waste, scrap of books and newspapers also known as ‘Broke’ can be used as raw material for making recycled paper. Because of many impurities which need to be removed from the scrap, the paper thus made is of inferior quality and weaker in strength and durability.

7.5 PROCESS OF PAPERMAKING

The process of paper making involves the following operations:

- Pulping
- Beating
- Loading
7.5.1 Pulping

Pulping or conversion of basic raw materials into pulp is the first operation in the process of papermaking. Pulping means transformation of raw materials such as rags, grass, and wood into a slushy mass. It involves cutting of raw materials into small bits, boiling it and beating it to form a pulp.

The wood pulp can be made mechanically and chemically.

(i) **Mechanical method**: Under this process, the logs are cut into small uniform sizes. These chips are forced against a revolving grind stone in hot water. The process separates the fibers in the wood. In mechanical method certain impurities remain in the pulp and therefore, cannot be used for making strong paper.

(ii) **Chemical method**: In the preparation of pulp by using chemicals as against mechanical force, the length of the fibers can be maintained and stronger paper can be made out of the pulp. In this process, the wood is cut into small chips and boiled in a chemical solution. The process dissolves the impurities and leaves behind the fibrous pulp. The wood pulp is then screened and washed. The chemicals used are caustic soda or bisulphate of lime. After the wood has been reduced to pulp, it passes through various processes to clean and purify it. The chemicals remaining in the pulp are thoroughly washed. The lumps formed during pulping are broken by rotating drums. This is done to get a smooth, consistent, thoroughly dissolved pulp. The broken material is then bleached. The bleaching agents (chemicals) are drained out.

7.5.2 Beating

The resultant stock (processed fiber) is then beaten in a beater. By beating, the fibers are torn apart and reduced to very tiny fragments. Beating is a process in which stock is passed through a stationary and rotary blade. The amount of beating determines the quality of paper but before pulp is transformed into paper, loading, sizing and colouring is added to the beaten stock.

7.5.3 Loading

When minerals and other fillers are added to the finish of a paper, the process is known as loading. It is done to make paper fit for writing. The gaps between the fibers are filled with some minerals to give it a smooth surface.

7.5.4 Sizing

The process of sizing is essential for preparation of writing paper. Sizing is done to reduce the porosity of paper by applying glazing or coating material such as starch, glue clay etc. The process of applying glazing material is called sizing. Sizing improves the hardness of the paper.

7.5.5 Colouring

In order to give a certain tinge of colour to the final product, sometimes, dyes and colours are added to the pulp during the beating operation so that a uniform colour is achieved.
The Process

After the wood (or rags or grass) has been reduced to pulp and has passed through the various processes mentioned above and cleaned, bleached, loaded and sized, it is ready to be made into paper.

The pulp or stock is then fed on to the vibrating mesh or wire of paper machine. The excess water in the stock or pulp is drained away. The remaining water is removed by a suction process.

Because of movement of the mesh, fibers tend to lie in the direction of flow and grains of the paper are thus formed. The cylinder wire roll provided in between the suction boxes to remove the remaining water, is called Dandy roll.

Dandy roll is also used in the process of papermaking to impress finished design, water marks or other marks upon the paper. The Dandy roll determines the kind of weave or design that will appear on the finished paper and such matters as whether or not the paper will bear a water mark or a trade mark.

The largely dried stock is then passed over a felt blanket onto a series of rollers which, by heat and pressure, squeeze out a large part of water. The remaining moisture is removed by hot drums.

The paper then is ready for calendering—a process by which paper is passed through rolls of calender to get smoothness, polish and required thickness and strength. Calendering is also a moisture removing device. After passing through calender rolls, paper is wound on reels which may later be converted into sheets.

7.6 KINDS OF PAPER

Paper is available in large varieties of finishes, qualities and weights, which can be put to a variety of uses. Sometimes the same kind of paper may be used in a variety of ways. The efficiency of a production manager lies in his ability to match the quality of paper with the process of printing.

The description of kinds of paper in the following paragraphs may give an idea about their distinct characteristics.

The most commonly used varieties of paper are:

7.6.1 Antique

It is a kind of printing paper with a rough and textured finish. It is pulpy and fluffy. The texture of this paper is loose. It resembles handmade paper in appearance. Because of its bulk, a book with lesser number of pages may look voluminous. Because of its uncalendered surface it is not suitable for half tone blocks or fine line blocks. Since it absorbs ink quickly, it is more suitable for the letterpress process. It comes in a variety of finishes.

7.6.2 Art Paper

It is a smooth-finish paper which is acquired by coating it with China clay and other adhesives. Coating is done on one or both the sides. Coating remains on the surface of the paper. When printing is done, ink does not penetrate into the fibrous part of the paper and therefore gives fine results for printing of half tone illustrations. The paper, because of its attractive finish, is generally used for printing publicity literature. These days matt finish art paper is also made. Heavily loaded clay makes it less durable. It cracks easily when folded and sticks in damp conditions.
7.6.3 Bond Paper

Bond paper (also called bank paper) is a rough, strong and durable paper mainly used for typing or for writing with other instruments, mainly for office use. Its durability is due to the large percentage of rag contents. This is a costly paper usually water marked, having a trade name or logo impressed into the surface of paper by a dandy roll during the manufacturing process. A slightly lighter paper of this variety is called 'Bank Paper'.

7.6.4 Book Paper

The paper commonly used for pages of the book is classified as book paper. It is a paper of durable quality. Book paper is often surface sized to make it suitable for offset printing. The quality of book paper has deteriorated during the past few years because of its mass use and even less durable acidic papers are being used as book paper.

7.6.5 Cartridge Paper

It is a hard, tough class of paper made with a rough surface. Available in many grades, it is particularly useful for drawings. Offset cartridge, though made for offset work, can be used for letterpress printing also. Fine line blocks and half tone blocks can be printed with equal ease on cartridge paper.

7.6.6 Cover Paper

A slightly thicker and durable quality of paper available in wide varieties of finishes, textures and colours is called cover paper. It is used for cover material of books and other publications. Cover paper is available in special finishes like linen, leather finish, plain and matt and comes in a variety of colours.

7.6.7 Imitation Art Paper

It is a cheaper quality of art paper heavily loaded with clay. Clay or filling medium is added at the pulp stage before paper is made into sheets. The pulp is made and dried and calendared the usual way but loading is done up to 30 percent of the total weight of the paper. Because of the larger clay content, it is also a weaker and less durable paper. As it has a smooth surface, it is also used for printing of half tone illustrations.

7.6.8 India Paper or Bible paper

The special characteristics of this paper are that it is very thin and at the same time very strong and opaque. Because of its compactness, it is used for printing Bibles, dictionaries and encyclopedias. A book printed on India paper will be at least three times lighter than a book of the same size printed on an ordinary book paper. It has acquired its name (India paper) because of its Asian origin.

7.6.9 Machine Finished Paper

A paper on which the surface is sized and calendared while actually in the machine. Sometimes extra calendaring is done to achieve smoother surface. This kind of paper is less porous and prevents fluid inks from spreading.

7.6.10 Machine Glazed Paper

This variety of paper is glazed on one side and rough on the other. The glossy finish in machine glazed paper is obtained by drying it against the polished surface on the heated cylinder of a paper machine.
7.6.11 Map Litho Paper

This variety of paper is used for printing by offset lithography. It has a smoother surface. This paper has its limitation that it cannot print good halftone by letterpress. It is widely used for books, magazines etc.

7.6.12 Newsprint

This paper made from wood pulp is the cheapest kind of printing paper. It is brittle and less durable. It is used for printing of newspapers and other materials not of lasting value like handbills, pamphlets etc. It usually has a rough surface (though glazed Newsprint paper with smooth surface is also available) and cannot give good results for line blocks and very coarse half tones.

7.6.13 Offset Paper

In fact any paper suitable for offset litho printing is called offset paper. It is well sized and slightly rough surfaced and less affected by moisture. This paper can print with good results line and half tone illustrations. This is used in letterpress also. This is also called plain paper.

7.6.14 Super Calendered Paper

This is a glossy finished paper of a quality similar to machine finished paper. Extra finish is obtained by a calendering stack with alternate hard steel rollers and soft rollers which impart a high gloss finish to paper as it slips between them. This variety of paper is capable of providing good image reproduction.

There are unlimited varieties of paper available and may be used for purposes other than the ones mentioned above. But these are some of the varieties of paper commonly used in book publishing.

7.7 PAPER SIZES

The ultimate unit of paper on which the book is printed is usually a sheet of paper. The sheet when folded once, twice, thrice or more times gives standard subdivisions and multiples of a broadside sheet. In order to understand standard book sizes, it is necessary to know about standard sheet sizes out of which subdivisions are derived.

A standard quantity unit of paper is a ream. A ream consists of 500 sheets. In the field of book production, paper is known by two names:

- **Size of the Sheet**: The name given to a sheet size with a standard fixed length and width such as 'Royal', 'Demy', 'Crown' etc. For example 'Crown' means a sheet of paper 15in × 20in.

- **Subdivision of Sheet Size**: It is arrived at by multiplying the standard size or subdividing the standard size by folding it once or twice or more times to arrive at the required size. Double crown would mean double the standard size of crown i.e. 20in × 30in. alternately crown octavo would mean that crown sheet has been divided into eight by successively folding across the longer size to get a page size of 5in × 7½in.

Each fold of the sheet is known by a particular name and gives a specific subdivision of a sheet size. The main subdivisions are:
7.7.1 Broadside

A sheet of paper of any size unfolded used for printing is called broadside or open sheet. A broadside sheet has two pages (sides). It is generally used for printing maps and illustrations.

7.7.2 Folio

When a standard size sheet is folded once it gives two leaves or four pages it is called Folio. The folding is done in the middle of the longer side of sheet. Folio is half the size of the broadside sheet.

7.7.3 Quarto

It is a page one quarter of the traditional broadside sheet size. When the sheet is folded twice it gives four leaves or eight pages. It is achieved by dividing shorter side of the sheet by two and the longer side of sheet also by two.

7.7.4 Octavo

It is a term used for a book made from sheets which have been folded three times, each sheet forming eight leaves or sixteen pages. The octavo size from a broadside sheet would be derived by dividing the smaller side by two and the longer side by four. For example, octavo of double crown (20 in × 30 in) would be 10 in × 7½ in.

7.7.5 Sixteen Mo

The term is used for a book size or a sheet subdivision which is arrived at by dividing each side of the sheet in four. It gives 16 leaves or 32 pages.

7.7.6 Double

A sheet which is double the size of the broadside sheet of any size is called a ‘double’. For example, when demy size is 17½ in × 22¼ in., double demy would be 22½ in × 35 in. This is arrived at by multiplying the shorter side of a broadside sheet.

7.7.7 Quad

In paper terminology, quad is a name given to a sheet which doubles the size of the shorter and longer side of any broadside sheet. The Quad size is arrived at by multiplying shorter side of the sheet by two and longer side of the sheet also by two. For example, Quad demy would be 35 in × 75 in., Demy size of the sheet being 17½ × 22½ in.

7.7.8 Section

A folded sheet after deriving the required page size is called a section. In different paper sizes, the number of pages in a section would vary. For example a section of Quarto size would be of eight pages whereas a section of octavo size would have 16 pages.

The following table gives the most commonly used papers, their multiples and subdivisions. All sizes are in inches.
<table>
<thead>
<tr>
<th>Name</th>
<th>Broadsheet</th>
<th>Double</th>
<th>Quad</th>
<th>Quarter</th>
<th>Octavo</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crown</td>
<td>15 x 20</td>
<td>20 x 30</td>
<td>30 x 70</td>
<td>7.5 x 10</td>
<td>5 x 7.5</td>
</tr>
<tr>
<td>Demy</td>
<td>17.5 x 22.5</td>
<td>22.5 x 35</td>
<td>35 x 75</td>
<td>8.25 x 11.75</td>
<td>5.5 x 8.25</td>
</tr>
<tr>
<td>Foolscap</td>
<td>13.5 x 17</td>
<td>17 x 27</td>
<td>27 x 37</td>
<td>6.25 x 8.25</td>
<td>7.25 x 9.25</td>
</tr>
<tr>
<td>Imperial</td>
<td>22 x 30</td>
<td>30 x 70</td>
<td>77 x 60</td>
<td>11 x 15</td>
<td>7.25 x 11</td>
</tr>
<tr>
<td>Medium</td>
<td>18 x 23</td>
<td>23 x 36</td>
<td>36 x 76</td>
<td>9 x 11.5</td>
<td>5.5 x 9</td>
</tr>
<tr>
<td>Royal</td>
<td>20 x 25</td>
<td>25 x 70</td>
<td>70 x 50</td>
<td>10 x 12.5</td>
<td>6.25 x 10</td>
</tr>
</tbody>
</table>

Activity 5

What is a section?

(Check your answer with that given at the end of the unit)

7.8 ISO PAPER SIZES (METRIC PAPER SIZES)

Some of the varieties of paper had very small differences in size. In order to standardize the variations, the International Standards Organization (ISO) defined three series of paper sizes namely A, B and C.

Untrimmed size of A0 measures one square meter. A series paper is mainly used for printing books etc.

An important feature of metric subdivision is that sides of each sheet always stay at the rate of 1:v2. Therefore, a size below a particular number (Subdivision) will just be half of the upper number. The following table will illustrate the point.

A Series Trimmed Sizes

<table>
<thead>
<tr>
<th>A Series</th>
<th>Dimensions in Millimeter</th>
<th>Approx. Inches</th>
</tr>
</thead>
<tbody>
<tr>
<td>A 0</td>
<td>871 x 1189</td>
<td>33 x 76.75</td>
</tr>
<tr>
<td>A 1</td>
<td>597 x 871</td>
<td>23 x 33</td>
</tr>
<tr>
<td>A 2</td>
<td>720 x 597</td>
<td>24.2 x 23</td>
</tr>
<tr>
<td>A 3</td>
<td>297 x 720</td>
<td>11.34 x 29.17</td>
</tr>
<tr>
<td>A 4</td>
<td>210 x 297</td>
<td>8.27 x 11.45</td>
</tr>
<tr>
<td>A 5</td>
<td>178 x 210</td>
<td>7 x 8.34</td>
</tr>
</tbody>
</table>

7.9 PAPER CALCULATIONS

In order to avoid wastage in ordering paper and estimating costs, it is necessary to have an approximately accurate idea as to how much paper would be required for
a given book if decision about the number of pages and size of the edition has been finalized. The following details need to be worked out to calculate paper quantities for a given edition:

1. Number of pages in the book (177 272, 336 etc.)
2. Size of sheet (Demy, Crown, Royal etc.)
3. Size of the book (page) (Quarto, octavo etc.)
7. Size of the edition (1000 copies, 2000 copies etc.)
5. Percentage of spoilage (3% or 5% depends upon the number of colours and process of printing).

Paper calculation: Paper quantities are calculated in terms of reams of paper.

A ream is of 500 sheets. For calculating paper in reams, the following method may be employed:

(Number of pages in the book × Number of copies to be printed)

÷ Number of pages in a section × 500 (Ream)

Section (Number of pages obtained by subdivision of a sheet size)

Example 1

How many sheets (in reams) in demy will be required for printing of 2000 copy edition of 368 pages book to be printed in octavo size (5½" × 8¼")?

Solution

In this case we have the following information:

1. Number of pages in the book: 368
2. Size of the sheet Demy: (17½" × 22½")
3. Book Size: Octavo
7. Section (Number of pages derived): 16 out of one sheet
5. Number of Copies to be printed: 2000

Now let us apply the formula:

\[
\frac{368 \times 2000}{16 \times 500}
\]

So we get, \[
\frac{368 \times 2000}{16 \times 500} = 76000 \text{ Sheets or 92 Reams}
\]

(Number or pages in a section) (Sheets in a ream)

The figure is without spoilage or wastage. To this figure, a certain percentage of spoilage or wastage is added. Spoilage varies according to the number of colours, process of printing, make-ready and size of the edition.
Sometimes a publisher has to decide the size of the edition on the basis of the paper stock already available. In such a situation, if one knows the size of the sheet and page size along with the number of pages, one can calculate the number of copies that can be printed out of that available stock.

**Example 2**

How many copies of a 128 page book can be printed if the size of the page is demy octavo and 8000 sheets of demy are available in stock?

**Solution**

In this example we know that

1. The Size of the sheet is demy i.e. $17\frac{1}{2}'' \times 22\frac{1}{2}''$
2. The Size of the book pages in demy octavo i.e. $5\frac{1}{2}'' \times 8\frac{3}{4}''$
3. There are to be 16 pages in a section.
7. Number of pages in the book are 128

The solution, therefore, would be as follows:

\[
\text{Number of pages per sheet} \times \text{number of sheets available} \quad \text{Pages in the book}
\]

Therefore the answer would be: \[
\frac{16 \times 8000}{128} = 1000 \text{ copies}
\]

**7.9.1 Weight**

Weight in printing parlance means the weight of paper in pounds or kilograms. It is important for the production manager to have knowledge about the weight of the paper being selected as most paper mills sell paper by weight.

In simple terms a 25 kg paper means that 500 sheets of that paper (called a ream) in a certain size (basic size) would weigh 25 kg.

Paper weight is also known as substance. It is defined as the weight in grammes of one square meter of the paper. It is measured in grams per square meter or called GSM of paper.

The weight of the paper in a pile, therefore, would be equal to the product of the paper substance i.e. area of sheet and number of sheet in that pile.

To find out the weight of one ream of paper containing 500 sheets in a given size the following formula is applied:

\[
\frac{\text{GSM} \times \text{Size of the sheet in square meter} \times 500}{1000}
\]

To put it more simply: \[
\frac{\text{GSM} \times \text{size of the sheet in sq. meter}}{2}
\]
Example 3

Find out the weight of one ream of 80 GSM paper in 38cm x 50cm size.

Solution: \[
\frac{80 \times 0.38 \times 0.50 \times 500}{1000} = 7.6 \text{ kg}.
\]

In the above example, we have calculated that the weight of 500 sheets of 80 GSM paper in 38cm \(\times\) 50cm is 7.6 kg. In order to calculate the weight of paper in a different size with the same G.S.M., the following formula may also be applied.

\[
\text{Known weight of paper} \times \text{required size} = \text{Size of the sheet (area) on the basis of which previous weight has been arrived at}
\]

Now if the 80 GSM paper in 38cm \(\times\) 50 cm weighs 7.6 kg, the weight of paper in 50 cm \(\times\) 62.5 cm would be calculated as follows.

\[
\frac{7.6 \times 50 \times 62.5}{38 \times 50} \times \frac{50 \times 62.5}{1000} = 12.5 \text{ kg}
\]

7.9.2 Bulk or Caliper

Paper thickness is described in terms of number of pages — may be to an inch or pages per inch. The term is also used to indicate the thickness of a book. Bulk is also known as Caliper. It is measured in thousandths of an inch.

It is desirable to know the thickness of the book in advance so that the actual size of the cover/jacket and area of spine (back of the book) may be finalized. The jacket design will lose its impact if the bulk of the book is not measured in advance.

Bulk or caliper is an important factor in deciding the book format. A short manuscript may be given a bulky look or a bulky manuscript may be given a manageable look by using a thicker or thinner paper respectively. Calendared sheet will have less bulk than others of the same weight.

7.10 SELECTION OF PAPER

A bewildering variety of paper is available to a publisher for book work. As we have seen in this chapter that paper ranging from unglazed newsprint to coated art paper can be used for book work. The decision to select one particular kind for a given book will be the result of various considerations. Paper being the main constituent in the cost of production of a book, the production manager can show his expertise in selecting paper which is economical but at the same time can give desirable results.

The selection of paper, therefore, is guided by the following factors.

7.10.1 Size of the Sheet and Size of the Book

As you know, the standard size of a book is derived from a standard size of sheet by folding it once, twice or more times. If we choose an unconventional size for
a book, we may have to waste a large amount of paper if the sheets are not available in its multiples from where a subdivision of book size can be derived. Therefore, the size of the book will determine the size of sheet in a given quality of paper.

7.10.2 Durability

As you have seen in the unit on raw materials, the durability of paper depends upon the raw material from which it has been made. Paper made from rags is more durable than paper made from wood pulp. Similarly there are acid free papers which are longer lasting than acidic varieties of paper. Durability also means higher folding endurance. Certain varieties of paper such as news print lack strength and tear easily when folded frequently.

7.10.3 Grain Direction

The direction in which most of the fibers in a sheet of paper run is called grain direction. Fibers running parallel with the larger side of sheet is known as long grain and when the fibers run along the shorter side it is called short grain. Where paper is folded against the grain direction, it tends to crack or folds raggedly. But when folded in the grain direction, fibers tend to fold evenly and smoothly. A book which is bound against the grain resist opening. The problem of paper stretch is minimised with a long direction sheet. It also helps in registering of multi coloured job.

7.10.4 Process of Printing

Suitability of paper for the process of printing is another essential consideration. For example, any plain paper may be suitable for letter press printing. But for lithography, paper with hard surface is preferred. In the gravure process, a fine screen can be printed on any kind of paper. The shade of the paper will however, affect (vary) the reproduction. In most cases, the shade of paper used is white but if the illustrations are bright then off-white paper may be preferred. Paper made from wood pulp is cheapest (but brittle) and therefore used for newspapers. Coated art paper is costlier and gives finer reproduction of illustrations and is, therefore, used for printing of halftone illustrations.

7.10.5 Thickness or Bulk

In the preceding pages we have noticed that there are certain varieties of paper which have more thickness than other varieties of paper. If the volume of the manuscript is small and publisher wants to give it a bulkier look, one may opt for antique paper which is 30% to 70% thicker than ordinary printing paper. Alternately, if the manuscript is voluminous and it is of lasting value, the choice may fall on Indian paper which is very thin and still very strong.

7.10.6 Weight or Substance of Paper

As paper is sold by weight, therefore, a lighter paper will cost much less than a heavier paper. But the weight of paper should be relevant to the nature of the book. For example, a text book for college students may be printed on a paper with lighter substance or GSM but a children’s book would need a heavier paper with more weight.

7.10.7 Shade of Paper

The shade of paper, when available in more than one variety, may also be considered. Paper is available in bright, white, off white and creamy shades. The option for a
particular shade may be exercised keeping in mind the nature of the book. Certain papers change shades with the passage of time.

7.10.8 Suitability to Printing Ink

Printing ink is made of colouring matter and a medium to hold pigments of colour. Inks dry by absorption into paper or by evaporation. On a porous surface, the absorption will be faster as against a smoother surface. Absorption factor, therefore, is very important. On a non-porous paper inks dry either by evaporation or by chemical change. Both these processes are slow. High speed printing may, therefore, pose the problem of smudging. The absorption and porosity depend on the kind of fibers used and treatment given during the process of paper making.

7.10.9 Opacity of Paper

The quality of opaqueness in a paper is another factor which plays a vital role in the selection. Opacity is measured in percentages with around 90% being the opacity of an average printing paper. Opacity is also related with the bulk of a paper. Coated papers have more opacity than uncoated paper. Papers coated on both sides are very opaque because of two layers of clay. The problem of ‘show through’ becomes apparent in a less opaque paper. Because of lower percentage of opacity, the printed image on one side is visible from the other side and this hinders the readability of the book.

Similar considerations must also be kept in mind while ordering or selecting paper for jacket and other materials.

7.11 SUMMING UP

In this unit we have provided information on various aspects of paper which is the mainstay of book publishing. We have talked about the brief history of paper, the materials used for making paper, the process by which paper is made. An attempt has been made to familiarize you with the varieties of paper and sizes in which it is usually available.

Calculation of paper is an important function of the production department. The methods of calculation of paper, its weight etc., has been explained with examples to help understand the formula. It is hoped that the information given in this unit should become handy in dealing with paper, its varieties and selection.

7.12 AIDS TO ANSWERS

Activity 1

It can also be defined as ‘A web composed of vegetable fibers, roughly oriented and matted together so as to form a sheet’.

Activity 2

Vegetable cellulose, rags or cotton, wood pulp, esparto grass

Activity 3

Pulping, beating loading sizing colouring
Activity 7


Activity 5

A folded sheet after deriving the required page size is called a section.

Activity 6

Durability, thickness or bulk, grain direction, suitability to printing

7.13 FURTHER READING


Sarkur, N N, Art and Print Production, Oxford University Press, 2008