

# PRINTtips

## The Job Isn't Finished 'Til The Paperwork Is Done

**A** high point of any printing project is selecting the paper to be used. All papers have properties and characteristics that need to be matched to the printing project to ensure the best outcome. In this issue, we will review the classifications and properties of paper that most affect how suitable a particular paper is for a job.

### Paper Classifications

The names that we use to refer to papers – bond, book, offset, text, writing, cover, coated, index bristol, label, tag – are very descriptive since they suggest what the paper is used for. For example, *bond* paper was originally used for printing bonds and legal documents; *book* paper was used for the interior pages of books; and *tag* was used to manufacture tags.

Because each type of paper had a designated use, each was manufactured with properties specific to that use, as shown in Figure 1.

### Paper Coatings

When paper has a coating applied, the surface becomes smooth and glossy and the sheet has a higher opacity. A coating improves *ink holdout* (low ink absorption) and reduces *dot gain* (the tendency of half tone dots to become larger on the sheet than on the lithographic film or press plate). All these characteristics improve the appearance of photographs and screen tints with sharper definition, improved density and better color fidelity than can be obtained on uncoated papers.

Coated paper differs in degrees of *gloss* (the degree of light reflectance from the surface of the paper). Matte has a

glare-free surface and is the least glossy; dull has sheen rather than a shine; gloss is shiny with a high degree of light reflectance; cast coated is a highly polished, mirror-like surface.

Paper may be coated on one side or two, either during the papermaking process or on independent coaters. Coatings are made from clay and other materials and are applied by rolls, air knives or trailing blades.

Uncoated paper may have *surface sizing* added. This treatment makes the paper resist penetration by water or other liquids and provides surface strength. This prevents *feathering* (uneven ink absorption) and *picking* (lifting of the paper surface during printing).

### Paper Finishes

A paper's *finish* describes its surface smoothness. The finishes given to uncoated papers, in order of increasing

Figure 1. Paper Grades and Uses

Paper Grade	Also Includes	Use	Properties
Bond	Writing, ledger, copier, laser	Letterheads; envelopes; business forms	Surface accepts ink easily from pen, writing inks, laser printer or ink jet. Can be easily erased.
Book	Coated, uncoated, text, offset	Trade and textbooks; magazines; booklets, brochures, announcements; general printing	<i>Coated</i> : surface smoothness and uniform ink receptivity <i>Text</i> : interesting textures and colors; may have surface treated to resist water penetration <i>Offset</i> : surface treated to resist water penetration; resistant to picking
Cover	Coated, uncoated	Booklet covers; business cards	Special surface textures available. Cover papers have dimensional stability, durability and good scoring, folding, embossing and die-cutting characteristics.
Index	Bristol	Covers, tickets, menus	Stiff; receptive to printing inks. Smooth or vellum finish.
Tag		Tags	Good bending and folding qualities; good tearing and water resistance

smoothness, are antique, eggshell, vellum, wove, smooth and lustre. The smoother the paper, the more opacity and ink holdout.

Another smoothing process is known as *calendering*. It is accomplished when the paper passes between a set or stack of horizontal cast-iron rolls at the end of the papermaking machine. The calender stack controls the *caliper* (thickness) of the paper as well as its smoothness and gloss. If the paper goes through a second calendering process, it has been *supercalendered*. Both coated and uncoated paper can be supercalendered.

Paper has two sides, each with different characteristics. The side that is against the wire of the papermaking machine is called the *wire side*. The other (top) side is the *felt side*, named because it contacts a felt belt. (Originally the belt was wool felt; today it is mainly synthetic material.) Paper that has been formed but is still about 50% water goes through a pressing process supported by the felt belt. If the belt has a textured marking felt, it will impart a texture to the paper on the felt side.

Some finishes are embossed on the paper after it has left the papermaking machine. The paper passes through a rotary embosser, dry and under pressure. *Linen* is a common embossing pattern.

### Paper Marks

Paper marks are made in the paper during the wet portion of the manufacturing process. A *dandy roll* rides on top of a moving web of paper to remove water and to lay down and compact paper pulp fibers. If a wire design is added to the surface of the dandy roll, it will affect the fibers and produce a *watermark*.

The watermark may be the familiar laid watermark; the name of the paper; or a company name.

### Paper Properties

*Formation* is the distribution of fibers and filler in a sheet of paper. The more uniform the distribution, the better the formation and the higher quality the paper. To test formation, back light a sheet of paper. Blotches (called *mottle*) will appear where fibers are dense; light areas indicate more filler. The greater the mottle, the poorer the formation and sheet quality. Formation is especially important when printing photographs and screens.

*Opacity* is the ability of the paper to obstruct light from passing through. Cellulose fibers (the main ingredient in paper) are transparent. Paper with more fibers or fillers absorb and diffuse light as it passes through the paper. The less light that passes through the paper, the greater the opacity and the less second side printing will show through to the first side. Opacity is measured on a scale of 1 to 100; the higher the number, the more opaque the sheet.

Guidelines for selecting an opaque sheet:

- Thick is more opaque than thin.
- Rough is more opaque than smooth.
- Coated is more opaque than uncoated.
- Dark is more opaque than light.

*Brightness* is a measure of a paper's ability to reflect light and is rated on a scale of 1 to 100.

The more light the paper reflects, the more specific light waves will be absorbed by the ink and the truer the color will appear. The ability of the human eye to assess brightness is compromised by such factors as the color (shade) of the paper and its gloss. A balanced white sheet reflects all colors equally and will reproduce color accurately. A white sheet that reflects more blue than red and yellow will appear to have a cool tinge and make colors appear brighter. A white sheet that reflects more red and yellow than blue will have a warm tinge and make colors appear clearer and stronger.

### Putting It All Together

Our paper merchants provide us with books listing all the papers they sell and the technical specifications of the papers. Using this information, we can select a paper for your printing project that has the correct opacity, brightness, color and finish. We can also show you samples and let you compare among options. Please call us for more information or to arrange an appointment.



If you would like to try your hand at papermaking, here is a recipe you can use at home.

#### Supplies

Fine mesh wire screen (size 9"x12")  
 Blotting paper  
 Basin or tray (10 quart capacity)  
 Laundry starch  
 30 sheets of facial tissue  
 Eggbeater or blender  
 Rolling pin  
 Electric iron  
 Scissors

#### Directions

1. Tear facial tissue into the basin. In a separate bowl, mix 1 tablespoon of starch with 2 cups of water. Add to tissue along with 10 quarts of water. Mix thoroughly with eggbeater or in the blender.
2. Dip the wire screen into the tray or basin and allow water to drain through the bottom of the screen.
3. Dry the screen and wet pulp between two pieces of blotting paper. (The pulp sheet will stick to them so that the wire can be separated from the pulp sheet.)
4. Press out excess water with the rolling pin.
5. With the sheet still between the blotters, iron the paper on a low setting until it is dry.
6. Trim the edges with scissors.

*With thanks to International Paper Company*

# a vocabulary of the graphic arts

**Basis weight:** The weight in pounds of one ream (500 sheets) of paper cut to a given standard size for its grade. For example, 500 sheets 23"x 35" of 20-lb. bond paper weighs 20 lbs. Base weight is not a good predictor of thickness.

**Bond:** Originally, a cotton-content paper used for printing bonds and legal documents. Today the term also includes some writing and digital papers. Basis size is 17"x22".

**Book:** A general term for coated and uncoated papers used in graphic arts. Equivalent in weight to text papers. Basis size is 25"x38".

**Brightness:** The percentage of light in a narrow spectral range reflected from the surface of a sheet of paper. Not necessarily related to color or whiteness. An extremely bright sheet reflects back almost all light to the viewer.

**Caliper:** Measure of paper thickness expressed in thousandths of an inch (mils). A micrometer is used to measure caliper.

**Cast coated:** Coated paper dried under pressure against a heated, highly polished drum to produce a high-gloss enamel finish.

**Coated paper:** Paper with a surface coating that produces a smooth finish and ink holdout in the printing process. Finishes range from matte to dull to gloss to cast coated.

**Cover paper:** Heavyweight paper with good folding characteristics. Can be coated or uncoated. Basis size is 20"x26".

**Deckle:** The width of the wet sheet as it comes off the wire of a paper machine.

**Deckle edge:** The untrimmed feathery edges of paper formed where the pulp flows against the deckle.

**Grain direction:** The direction in which most fibers orient themselves in the papermaking process. When the web of paper is sheeted, the sheets will be grain long (fibers follow the long side of the sheet) or grain short (fibers follow the short side).

**Ink holdout:** A characteristic of paper related to its capacity to keep ink on the surface rather than absorbing into the sheet. The greater the ink holdout, the sharper the printed image.

**Opacity:** Measure of the percentage of light passing through a sheet of paper. The more opaque the paper, the less show-through from printing on the sheet below. Basis weight, brightness, type of fibers, fillers and coatings all affect opacity. In general, opacity and brightness are inversely related.

# TRICKS & tips

**T**o select a paper for a particular printing project, begin by listing how the finished piece will be used and what processes will be required in the manufacturing process. This will allow you to determine what paper characteristics (basis weight, brightness, smoothness, ink receptivity, opacity, strength, caliper, gloss, grain and finish) are the most important for the project.

Here are some questions to help define the purpose of the printing project.

- Is it an image piece?
- What is the finished size of the piece?
- Will the piece be read once and discarded or must it last many years?
- Will the piece be handled repeatedly?
- Will the piece include full color photographs?
- Will the piece be mailed? If so, will it require an envelope?
- Are there any special manufacturing processes (die cutting, embossing, foil stamping)?
- Must postal requirements be considered?
- What is the printing process to be used (offset or digital)?

Our customer service representatives have been trained to match paper characteristics with the production and end use requirements.

**Q.** What can you tell me about using recycled papers?

**A.** Recycled paper is paper that has been manufactured from recovered waste paper. The waste paper comes from three primary sources:

- *Pre-consumer waste* is paper that has not yet reached an end user. An example is an unsold magazine that is collected from a newsstand.
- *Post-consumer waste* is paper that has been used. An example is a magazine mailed to a home and read by the subscriber.

- *Converting waste* is paper scraps and waste in the papermaking process. An example is trim from converting paper to envelopes.

Beginning in 1999, copier paper, offset paper, envelopes and other uncoated grades were required to conform to a standard of no less than 30% post-consumer materials. Coated grades are no less than 15% post-consumer materials.

It may surprise you to learn that the primary benefit of recycled paper is saving landfill space. According to Conservatree Paper Company, every

ton of recycled paper saves three cubic yards of landfill material. It also saves 17 trees, 7000 gallons of water and 4100 kilowatts of energy (enough to power an average home for six months).

There are some costs associated with recycled paper. Waste paper must be collected, then sorted, baled and transported to the paper mill. Finally, it must be de-inked prior to being mixed with virgin fibers in the papermaking process.

When deciding whether to specify a recycled paper, consider the following pros and cons:

Recycled Paper Pros	Recycled Paper Cons
Uncoated recycled paper tends to lie flatter, making it easier to handle.	Some recycled papers may not last as long as papers made with virgin fibers.
Opacity of recycled paper can be better because the shorter, fatter reclaimed fibers form a denser structure.	Because not all ink can be removed from recycled paper, the brightness is often lower.