On Paper

BY CONSTANCE J. SIDLES

Sheet Smarts

A designer asked me to troubleshoot a book she and her partner had recently produced. The job was a 32-page children's picture book with beautiful illustrations printed on very fine paper. "So what's the problem?" I asked.

"Look at it," the designer cried, flinging it onto the table. Instead of lying flat, the pages rippled in roller-coaster waves of buckled paper. There was no denying that the book would appeal to children, though not for reading. Any child worth her salt would immediately see that the best way to use the book was to drive her toy Ferrari over the hills and dales. Vroom, vroom.

"I take it this book isn't supposed to be interactive," I said, but the designer was too upset to smile.

"I think the printer left these books out in the rain," she said.

Her suspicion isn't as ditzy as it sounds. Although rain was unlikely, it is true that sheet-fed paper can sometimes buckle if it isn't allowed to come into equilibrium with the ambient humidity and temperature of the pressroom. According to the Graphic Arts Technical Foundation, paper can require as much as four days to acclimate fully. Sheets that have not been conditioned properly will show wavy edges, and the press will produce creases and misregisters when it prints on such paper.

While the designer's book was inarguably wavy, it wasn't misregistered or creased. So I suspected another culprit—not rain, but grain.

Let me explain. If you've ever seen paper manufactured, you know that a slurry of wet pulp (called furnish) is poured over a vibrating screen of fine mesh, which moves forward continuously like a conveyor belt. The wet furnish spreads out into a thin layer on the screen. Excess water drips out of the furnish as the conveyor belt moves forward. When the water drips out of the furnish and the pulp starts to dry, the paper fibers begin to align themselves parallel to the direction of the belt. When the paper is completely dry, it thus has a grain.

After the newly formed paper has been dried and polished, it is rolled into gigantic logs. These logs are then cut into smaller rolls, which become the "webs" on a web press. To make sheet-fed paper, the rolls are cut into individual sheets. Paper mills can cut the rolls into many different sheet sizes. Depending on how the blades are set, paper can be cut so the grain runs parallel to the long side of the sheet, or perpendicular to it. Sheets with the grain parallel to the long side are called grain-long; sheets with the grain perpendicular to the long side are called grain-short.

You can tell grain direction in two ways. First, look at the dimensions of the paper as stated by the manufacturer. The grain direction is always given last. So a sheet that measures $8^{1}/_{2}$ by 11 has the grain running parallel to the 11-inch side. Another way to determine grain direction is to curve the sheet over slightly, as though you were going to fold it. First curve the sheet the long way, and then curve it the short way. When you press your hand against the curve of the paper, you will notice more resistance when the curve is against the grain.

Whenever you use paper that will be bound or folded, you should pay attention to paper grain. If you want paper to lie flat after it's bound, then you've got to use paper with the grain parallel to the binding. Paper bound with the grain perpendicular to the binding will curl and wave. Similarly, paper folded with the grain folds more cleanly and easily; it also tears more easily along the fold. So if you want a strong fold, you should use paper that folds against the grain.

If the lie-down characteristics of binding conflict with the strength demands of folding, you have to decide whether folding strength is more important than flatness.

In the case of the children's book, the folded binding was very strong, since it went against the grain. But the pages would never lie flat. When the printer selected the paper for this job, strength was more important than flatness in his judgment, because he knew that children are hard on book bindings, especially ones that are saddle-stitched. Unfortunately, the designer thought flatness was more important.

Neither one consulted the other, and that was the real problem. ◆

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