

Case-bound Book Page Distortion



Sappi Printer Technical Service

877 SappiHelp (727 7443)

Problem

The text pages at the immediate front and back of the case-bound book, exhibit a permanent wavy or non-flat appearance.

Description

The first and last 5-plus pages at the front and back of the case-bound book-block exhibit a wavy, puckered distortion, usually the full length of the page. Not to be confused with fluting, this distortion, usually parallel to paper grain direction, is deeper, non-uniform, and more pronounced than fluting. The severity of the distortion is typically worse on the pages nearest the casement, and then decreases in severity on subsequent pages. The problem may also be accompanied by slight edge-scallop along the head and foot of the book-block, affecting pages throughout the book. When this problem occurs, the book-block is usually printed web heatset, a print process that removes moisture from the paper as it dries the ink. Additionally, the end sheet may exhibit the same level of distortion as the first page of the book-block. Even the board used for the casement may show signs of warping or cupping, giving the cover a pronounced “ski jump” appearance.

Cellulose fiber is hygroscopic in nature. It expands or contracts as it gains or loses moisture relative to the moisture content of its surrounding environment. The greatest expansion/contraction occurs with the largest moisture differential between paper and its environment. Cellulose fiber will expand and contract more in width than in length, so paper will grow or shrink more in the cross-grain direction. Most case-bound books are properly constructed with the paper grain of the book-block parallel to the spine. Therefore, any dimensional change in the paper caused by excessive post-bind moisture absorption and retention will result in a wavy appearance parallel to the spine. This issue may also occur with a book-block improperly manufactured perpendicular to the spine, resulting in a defect known as buckling-at-the-spine. Paper dynamics are the same, but the distortion occurs in closer proximity to the spine (See Sappi tech tip on Buckling at the Spine).

Causes

- The printed text signatures were not fully re-acclimated prior to binding.
 - If the moisture content of the printed text was not stable prior to binding, the paper will gain or lose moisture post-binding, causing the text to adversely grow or shrink depending upon the ambient relative humidity.
- Moisture differences within the book’s construction.
 - The paper used for the end-sheet is usually made from a heavier uncoated paper, considerably different from the coated and printed text paper. Being a dissimilar, interleaved substrate, most likely higher in moisture content, this end-sheet paper may adversely distort the printed book-block by giving up moisture to adjacent pages much drier in

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moisture content.

- The water-based PVA glues used to attach the end-sheet-to-case and/or book-block-to-case are typically low-solids formulations to assure good penetration and adhesion. Excess moisture from the drying glue may absorb into the adjacent text pages causing wavy distortion of the beginning and ending pages of the book-block.
- A large disparity in moisture content between the case-board and the book-block will cause the text to either gain or lose moisture. This moisture disparity may cause adjacent pages to buckle and become distorted.

— Caliper of the case-board.

- Lower caliper equates to lower stiffness. Inadequate stiffness increases the chance for warping or cupping of the cover.

— Post-press transit, storage, and/or binding transpired in adversely low or high humidity environments.

Options and Solutions

— Paper

- The type and size of fibers used to make paper, along with moisture content, vary from mill to mill. Fiber reactivity to changes in moisture will also vary. If possible, construct a dummy using all the book components to assure compatibility.

— Press

- Run web heatset driers at lowest possible temperature to minimize moisture loss in the paper. Excessive drying decreases the moisture content of the paper. Lower moisture content makes the paper more susceptible to distortion when exposed to wide swings in environmental conditions.
- Re-moisturize the printed web paper after the chill stand.

— Components

- Recommend a minimum of 98pt board for case.
- The lay-flat film laminate used to protect and enhance the outside cover-to-case bonding should be semi-permeable to prevent moisture trap.

— Acclimation & Storage

- Allow printed signatures time for re-acclimation prior to binding. Allotted time for re-acclimation will vary depending upon the ambient humidity of

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the storage area and moisture content of the printed paper, but the general consideration is 2 days for sheetfed and 4 days for heatset web in a climate-controlled environment of 45% Rh @ 72° F. (22° C.). Heatset web delivers an especially dry product demanding additional time to re-acclimate through moisture absorption. (See Sappi tech tip on Web Growth).

- Fully acclimate the finished book-blocks, board, and end-sheet paper together to ensure the components come to equilibrium for recommended temperature and relative humidity prior to case-binding.
- Allowing the unwrapped case-board to acclimate to the production environment in advance of assembly may prove especially beneficial. The basic recommendation is 24-48 hours.
- Store finished books in a controlled environment of 45% Rh @ 72° F. (22° C.).

— Assembly

- Assemble cases 24 to 48 hours in advance depending on climate and the amount of adhesive applied during case-making.
 - The solids content of the protein-based adhesive for the outside cover-to-case bonding during case-making should be as high as possible to minimize potential for high moisture absorption and retention.
- It is recommended that the casing-in water-based PVA adhesive (end-sheet-to-case and book-block-to-case) contain adequate solids for maximum adhesion while still maintaining the necessary properties for good glue penetration.
- When cost-effective on short runs or high-end titles, hand-insert a temporary moisture barrier immediately after case-binding between the end-sheets and the book-block for at least 24 hours. These barrier sheets, typically C1S cover, can be removed after the glue moisture has adequately dissipated. Depending upon the moisture content of the glue, and ambient conditions of relative humidity, the full drying process may take up to several days. (Upcharges may apply).