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NEWS

Using Spreadsheets for the Phase Boxing of Books

by Karen E.K. Brown

What is a 'Phase Box'?

A "PHASE BOX" IS A SIMPLE, low-cost enclosure that is designed to protect brittle and deteriorated books from damage during storage and transport. Books with missing or disconnected cover boards or spines, fragile or damaged covers, and unbound journal runs (especially those short-lived titles that are not considered for routine commercial binding) are all excellent candidates for boxing. When constructed of high quality materials and properly fitted, a phase box can prevent further damage by providing additional physical support and keeping loose parts from becoming separated. Boxes constructed of solid fiber "boxing" board (rather than corrugated or folder stock) can also reduce the risk of fire damage by obstructing and slowing the movement of heat and flame into the container.

The phase box gets its name from the concept of "phased conservation", first introduced at the Library of Congress by

Figure 1. The *Phase Box Maker* easily creases solid fiber board.

Conservation Officer Peter Waters in the mid-1970s. The strategy was to treat items or collections in stages (i.e., phases) over time, with an emphasis on large treatment and rehousing projects. Phased conservation can include rehousing, upgrading the storage environment, improving storage and handling practices, disaster mitigation, or treatment, depending on identified needs and priorities. A custom enclosure,

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however, may be the only attention given to a majority of holdings at the item level.

This article describes the use of spreadsheets to improve the efficiency and cost effectiveness of in-house custom phase-box construction. Here at the University at Albany we implemented the use of a simple worksheet to calculate the dimensions of the boards to be cut, as well as the location of all creases, based on the size of the book and the thickness of the board stock. While a certain amount of dexterity and attention to detail is essential, we found we spent less time doing math, had fewer mathematical errors, and made fewer mistakes in the cutting and folding (hence less waste). Our cost per item is about $10.00 for the average size book (including student labor, board, and other materials). Last year student assistants constructed almost 300 phase boxes; we expect to continue working at about this level of output in the immediate future.

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After almost two years of trial and error, testing, rearranging, rethinking, and revamping our boxing program, we have achieved a productivity level of approximately one complete box per hour, producing twice our productivity rate from when we first offered the service. I thought it might be useful to provide some background on our project, as well as the details of the spreadsheet formula, to assist others with analyzing and improving their boxing processes.

Project Background

The Preservation Department moved into new lab space in the fall of 1999, more than doubling our workspace to just over 2600 square feet. This allowed us to expand the range of preservation services that the department could offer to the University Libraries.

One of the first new services was phase box construction. Specialty equipment was purchased, including a *Phase Box Maker #20000* from Hollinger Corporation ($1995; Figure 1); without this there is no easy way to fold solid fiber board on this scale of production. In addition, we purchased a *MEASUREpHASE*™ to help obtain quick, accurate measurements of the books, a *Model 20 Corner Rounder*® from Lassco Products, Inc., to improve the appearance of the final product (Figure 2), and a rivet fastening machine and supplies for the box closures.

Figure 2. The *MEASUREpHASE*™ gives quick, accurate book measurements and the *Corner Rounder* improves the appearance of the final product.

In the fall of 2001 we were set to begin. Without too much trouble we were generating high-quality boxes, but the productivity rate was low (2 hours/box). To increase our rate, a few simple changes were made to the process, including reorganizing the lab space to keep related tools/equipment within easy reach; wrapping oversize bricks and "stacking" completed boxes to dry (thus using our table top space more efficiently); and purchasing a small hand drill to make holes for the rivets (rather than using a punch to get it started). Items of the same approximate size were batched for processing; each step of the process was completed for all books before moving to the next step. We were moving a little faster (1.75 hours/box based

on monthly statistics and hours worked just making boxes), but there was still much room for improvement.

The next change was the type of closure. The use of rivets and linen thread is sturdy (great for book drops), but required 5 to 10 minutes per box for drilling holes, attaching rivets, cutting and attaching the string. These steps also delayed the workflow. Furthermore, Circulation staff found tying and untying cumbersome. We tested the use of Velcro® buttons or magnets and eliminated the foredge flap from our design (the closure is now between the third and fourth flaps). Both Velcro® and magnets work fine when attached with PVA (rather than relying on the pressure sensitive adhesive). We prefer the use of magnetic stripping, even though the cost is slightly higher than other options: they are strong, aesthetically pleasing, and the closed box can be shifted slightly to more perfectly fit the enclosed volume. The closure is attached when the box is complete, rather than in several steps during construction. We estimated the time per box was down by another 15 minutes to 1.5 hours/box.

It was then that I recognized the next and most obvious obstacle to improving productivity: basic math. Students have to measure, add, subtract, estimate, eyeball, and practice to get up to speed making phase boxes. Mistakes are common. Besides being a "re-do" (which costs in staff time), folds in the wrong location can also mean discarding long strips of board stock (with increased cost to our supplies budget). It was serendipitous that at the same time we were figuring out our phase box project, I was learning about using a spreadsheet to manage the department's budget. A bell went off: why couldn't we use a spreadsheet to do the calculations for us? No reason that I could see, except fractions, of course. However, using metric measurements, rather than the English system, would allow use of a spreadsheet to do the calculations. The student who worked through the first part of this project was, like the department head (me),

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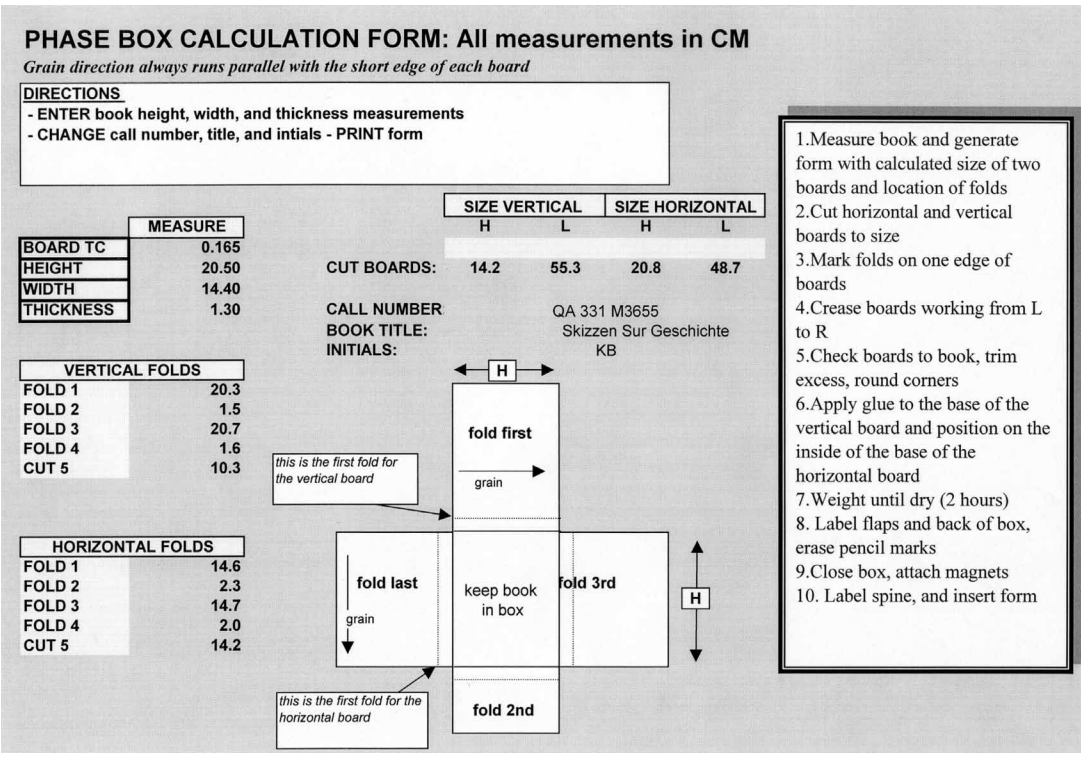

Figure 3. A simple spreadsheet calculates board dimensions and creases.

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used to thinking in metric, so this was not a problem. We went to work setting up and testing the worksheet.

Setting Up Your Spreadsheet

The spreadsheet that we developed is based on the fundamental concepts of custom phase-box construction. We determine 1) the dimensions to cut each sheet of board stock, and 2) the exact location of each fold based on the size of the book and the thickness of the board stock. We measure our books to the nearest millimeter (rounding up, rather than down) using the *MEASUREpHASE*™ fitted with a metric ruler. The thickness of the board stock is most accurately determined using a pocket thickness gauge (0.01mm-10mm from Mitutoyo), although measuring with a ruler can work just fine.[1] These measurements are entered into the spreadsheet to generate the results, based on the following calculation formulae. Refer to Figure 3 to follow our example (the letter designation is the x-axis of the spreadsheet; the number is the y-axis):

Vertical Board Folds

Fold 1	Book height minus 1 board thickness (C12-C11)
Fold 2	Book thickness plus 1 board thickness (C14+C11)
Fold 3	Book height plus 1 board thickness (C12+C11)
Fold 4	Book thickness plus 2 board thicknesses C14+(2*C11)
Cut 5	Book height divided by two (C12/2)

Horizontal Board Folds

Fold 1	Book width plus 1 board thickness (C13+C11)
Fold 2	Book thickness plus 4 board thicknesses plus the thickness of your closure C14+(4*C11)+0.295 (in our example 0.295 cm is the thickness of two magnets)
Fold 3	Book width plus 2 board thicknesses C13+(2*C11)
Fold 4	Book thickness plus 4 board thicknesses C14+(4*C11)
Cut 5	Book width minus 1 board thickness (C13-C11)

The boards are cut according to the following calculation formulas, based in part on the results, above:

Vertical Board Size

The height (H) of the board is the width of the book minus 0.2 cm; we subtract this small amount to keep the fit nice and tight (C13-0.2).

The length (L) of the board is calculated by adding the measurements of vertical board folds 1-4 plus Cut 5, with an additional centimeter to allow trimming to the exact size before gluing: (C18+C19+C20+C21+C22+1).

Horizontal Board Size

The height (H) of the board is the height of the book plus 0.3 cm (C12+0.3).

The length (L) of the board, again, is calculated by adding measurements for the series of Horizontal Board Folds 1-4, plus Cut 5, plus an extra centimeter: (C27+C28+C29+C30+C31+1).

Final Construction

After generating the results using the spreadsheet, each set of boards is cut and inscribed with its associated call number. The location of each fold is marked (working left to right), the boards are creased, and the fit is checked to the book at hand. The box should fold comfortably, without forcing, so the corners easily "nest" into one another. Any gaps at the corners should be minimal, and the book should not shift inside its enclosure. After trimming any excess from the length of each board, the corners are rounded and the two boards are attached to each other by gluing out the back base (center) of the vertical board (Figure 4), positioning it on top of the horizontal board, and weighting until dry. Finally, Fold First, Second, Third, Last, and "Please Keep Book Stored In This Box At All Times" labels are prepared (using a word processor) and adhered, pencil marks are erased, and the closure is glued into place. The finished stack is weighted for an hour or so to make sure the closure sticks well before routing for the shelf.

Figure 4. Applying adhesive to the center of the vertical board.

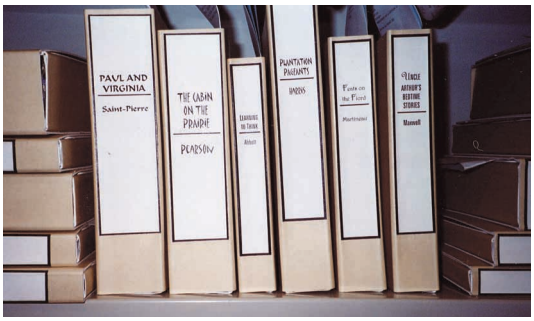

Figure 5. Shelved books are neatly boxed, clearly labeled and protected from damage.

Time per box: approximately one hour. By using the spreadsheet we shaved an average of 15-30 minutes per box off of our production time with less waste.

In addition to constructing phase boxes for "standard" size books (under 31 cm), oversize boxes are made by reinforcing the inside base with a second sheet of board stock; the calculation is increased by adding that extra board thickness to the thickness of the book itself (C14+C11 is what is entered as the measurement for C14). Two magnetic strips are used for the closure on larger phase boxes. The University at Albany also boxes some undersize books into larger phase boxes (15 x 20 cm) so they can be shelved along with our regular holdings. The excess space inside the box is filled with rolled boxing board "tubes" adhered along the bottom and left sides of the base. This keeps the book from shifting inside its box, reducing the risk of damage during handling and transport. These options take slightly longer to construct but are still less expensive to build in-house than purchasing them from a commercial service.

Are There Other Options?

There are many options for creating enclosures in-house, depending on the size and scope of your preservation program, and what you have that would benefit from being placed inside an enclosure. Commercial library binders and others can

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be contracted to create custom-made boxes, including drop-spine and phase boxes. Their base price for a phase box from solid fiber board for books up to 12" in height and 2" in width starts at around $15.00. Another alternative, especially for volumes with no or low-circulation rates, are lightweight, sturdy boxes made of corrugated board. These can be purchased in standard sizes from a reliable preservation supplier or custom-sized from a commercial vendor. As with phase boxes ordered from a library binder it is usual for the institution to measure the books themselves and supply the dimensions to the vendor. Styles can vary, but the "clamshell" design is most common. The patterns for these corrugated boxes are stamped out with a die and creased where needed; they will require assembly in-house. Labels can be ordered, but you will still need to adhere them.

The use of a simple spreadsheet can improve the practicality of constructing phase boxes in-house. Like basic repair, reformatting, or other preservation services, the output must be high quality and cost effective if it is to compete with commercially available products and services. Our approach may serve as a useful model for other small- or medium-sized preservation programs that currently offer, or wish to offer, this preservation service option.

FURTHER RESOURCES

Carlson, Lage, John Bertonaschi, Margot Healey, et al, comps. *Boxes for the Protection of Books: Their Design and Construction.* Washington, D.C.: Library of Congress, 1994.

Clark Morrow, Carolyn, and Carole Dyal. *Conservation Treatment Procedures: A Manual of Step-by-step Procedures for the Maintenance and Repair of Library Materials.* 2nd ed. Littleton, CO: Libraries Unlimited, Inc., 1986.

Jones, Maralyn, comp. *Collection Conservation Treatment.* Berkeley, CA: University of California, Berkeley, 1993.

Kulka, Edward. *Archival Enclosures: A Guide.* Ottawa, ON: Canadian Council of Archives, 1995.

Zeier, Franz. *Books, Boxes and Portfolios.* New York, NY: Design Press, 1990.

ENDNOTE

1. I thought a few notes about best use of a hand-held micrometer would be useful. Be sure to "zero" the dial and clean the contacts before measuring. Insert a small (3 cm square) sample of your board stock between the contacts. Do not hold the sample with your opposite hand. To be accurate one should take 4-5 measurements and use the average as the board thickness. We use the highest measurement plus 0.10 mm, converting to centimeters for use in our spreadsheet (1.55 mm plus 0.10 mm for a total of 1.65 mm or 0.165 cm).

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LBS/Archival Products Sponsors University of Iowa Libraries Conference

In the fall of 1987, LBS/Archival Products sponsored a conference in Des Moines entitled *The Lessons in History and Experience in the Design of Conservation Bindings*. We are now proud to co-sponsor a similar conference at the University of Iowa (UI) Libraries, UI Center for the Book for their 2005 conference celebrating the legacy and future of book conservation. The conference named *Preservation of the Changing Book, An Exposition of the Field of Book Conservation* will take place in Iowa City, IA July 22 through 25, 2005. This gathering of accomplished book conservators, conservation educators, researchers and specialists will interact with students, practitioners and the wider audience of those interested in preservation and the persistence of the traditional book.

Scheduled Exhibits

- "Master Book Builder; the Craft and Art of Bill Anthony" at the University of Iowa Museum of Art, curated by Larry Yerkes. A publication; *Master Book Builder: the Craft and Art of Bill Anthony,* will provide a comprehensive catalog of the retrospective exhibit.
- "Bookbinding Across Culture and History" at the Main Library will include a binding model collection and equivalent exemplars from Special Collections, curated by Gary Frost and Kristin Baum.
- "The James' Collection and other related collections at the UIL" at the University of Iowa Special Collections, produced by Special Collections.
- "Student Show", University of Iowa Center for the Book exhibit, North Hall, produced by the University of Iowa Center for the Book.

With the diversification of library services, reading and research practices are continuously evolving and multiplying which places greater demands on preservation programs and the care of nonbook media. Within this context, the specialty of book conservation is being realigned within a larger field of preservation, yet continues to develop its own agendas and programs. The conference proceedings will provide an opportunity too review and examine book conservation practice in terms of its own prospects, and with an eye toward the future and persistence of the book.

Conference speakers will provide perspective to illustrate trends in the development of the field. They will suggest prospects for those beginning their careers and examine opportunities for continuing training. They will also discuss the continuing relevance of the specialty and their own hopes and visions for the future of book conservation practice. The current speakers' list tentatively includes:

Lynn Amlie, Director and Paper Specialist for the University of Iowa Center for the Book's Research and Production Paper Facility, Iowa City, IA

Jim Canary, Conservator for the Lilly Library, Indiana University, Bloomington, IN

Chris Clarkson, Conservator and Lecturer, United Kingdom, John Dean,

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Director, Preservation & Conservation, Cornell University, Ithaca, NY

Katherine Hayles, Author and Professor of English, University of California, Los Angeles, CA

Chela Metzger, Consultant, Conservation and Treatment of Books, Austin, TX

Bill Minter, Book and Paper Conservator, Woodbury, PA

Roberta Pilette, Chief Preservation Officer, Yale University, New Haven, CT

Pamela Spitzmueller, Chief Conservator, Weissman Preservation Center, Harvard University, Cambridge, MA

Optional Pre/Post Conference Day-trips

Library Binding Service tour,
Des Moines, IA
Museum of Typesetting Technology,
Denmark, IA
Tour of local binderies and book stores
University of Iowa Center for the Book facilities

The University of Iowa Libraries is calling for presentations and technical demonstrations. If you would like to submit a proposal for a presentation or demonstration, please forward your application and contact information to gary-frost@uiowa.edu.

Plan to join us in Iowa July 2005 for a distinguished program and an enjoyable reunion with friends! For further information view the conference website www.lib.uiowa.edu/preservation/pages/news/Event2005.htm.

Retirement

Millie Knee, Archival Products Account Representative, retired January 16 after working closely with customers for 10 years to help find solutions and ensure accurate delivery of orders. We wish Millie a fun and fulfilling retirement.

Vicki Howell from our administrative offices filled in temporarily during our search for a permanent replacement. Melinda Sinnott began as your new Archival Products Account Representative on March 8. Melinda, a recent graduate from Iowa State University with a Bachelor of Arts Degree in Advertising and a minor in English, brings her previous marketing, public relations and sales experience with her and is ready to discuss your preservation needs with you. We welcome Melinda to our team.