

## Notes on Aluminum-Walled Book Boxes: Large and Strong but Lightweight

### ABSTRACT

Boxes for large books and other items in collections can be made strong yet lightweight using a thin sheet of bent aluminum for the walls. With basic modifications and simple fabrication, this strong and lightweight material can be used to make the types of storage boxes that are commonly found in libraries and archives. This paper describes how thin aluminum roll stock, commonly used by building contractors, can be used to make the walls in two styles of standard boxes: traditional drop-spine boxes and custom-made corrugated boxes.

### TRADITIONAL DROP-SPINE BOX COVERED WITH BOOKCLOTH

The use of thin aluminum sheeting in place of binders' board for drop-spine boxes originated when five very large and heavy books needed protection. Each of the leather-bound volumes in the set was 16 x 24 inches and weighed about 22 lbs. While a standard phase box would have been inexpensive, there were concerns about handling the large flaps. Alternatively, a standard drop-spine box would have required double-wall construction for strength, and the resulting box could easily have weighed 10–12 lbs. That extra weight seemed excessive. These books needed boxes that were strong yet lightweight. One possibility was to make the walls of each box from the thin aluminum used by building contractors for roofing and window trim.

In this first style of box, large sheets of aluminum (0.019 in. thick) were lined with acid-free paper using ColorMount heat-set adhesive. The paper laminate was necessary because most conservation adhesives will not bond to aluminum. To allow for better adhesion, the painted aluminum surface was abraded before applying the heat-set adhesive and paper. The laminated aluminum was then cut into long, 5-inch-wide strips, which were bent along their length so their cross-section was an L

shape with a base of 2 inches and a height of 3 inches. The book's thickness was measured, and the height of the wall was easily trimmed to the correct dimension in a board shear. Using the height and width measurements of the book, the base of the long L-shaped strip was then marked for the 90-degree miter cuts that were needed at the corners of the box. These miters were easily cut with tin-snips, and the aluminum was then bent to form the strong corners and walls (figs. 1, 2).

For these large drop-spine boxes, two separate pieces of aluminum were used to form the walls of the bottom tray. This configuration provided two side openings for easy access to the large book (fig. 3). An insert of 20-point cardstock was cut to fill the space between the two U-shaped wall units, then the bases of the aluminum wall angles and the insert were laminated between two more pieces of 20-point cardstock before covering with bookcloth. When using water-based adhesives, this lamination can be a bit tricky because of the expansion and contraction of the cardstock. A possible alternative would be to use pressure-sensitive adhesives, but no tests have been done. The assembled tray was adhered to 40-point cardstock for more rigidity; a fore-edge flap of 20-point cardstock was added.

To further reduce the weight of the box, the top tray was made in a similar way, using a single piece of L-shaped aluminum to make three walls only 0.5 inch deep (fig. 3). This shallow tray was designed to secure the fore-edge flap of the box. Again, the base of the tray was made from three pieces of 20-point cardstock laminated together, while the spine piece was cut from 40-point cardstock. After covering with bookcloth, the resulting box was very sturdy and weighed about 4 lbs., which is much less than a standard double-wall drop-spine box.

In the completed box, an elevated platform with hand notches also improves access to the book (figs. 3, 4). Initially, acid-free corrugated board was used for the platform, but Volara foam was eventually substituted. The foam was covered with Stonehenge paper for a suitable look. Each book was also provided with a protective cotton flannel wrapper (fig. 5) to prevent scratches.

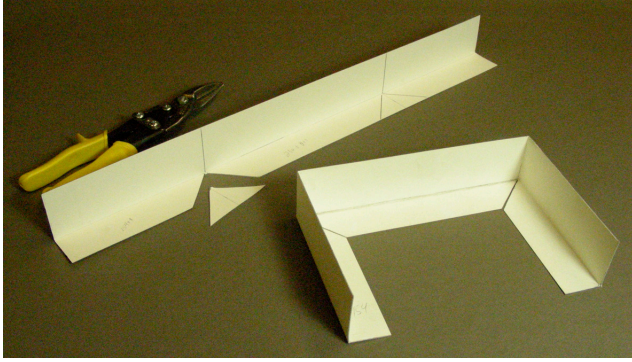


Fig. 1. L-shaped aluminum strip with paper laminate, mitered and bent for the walls of a box



Fig. 2. This thin aluminum wall, laminated with acid-free paper and covered with starch-filled buckram, measured 0.045 in. thick, whereas a double wall of binders' board would have been 0.140 in. thick and weighed much more.



Fig. 3. The completed box includes a bottom tray with hand notches, lined with paper-covered Volar foam, and a shallow, lightweight top tray that secures the fore-edge flap, thus stabilizing and sealing the box from dust, etc.



Fig. 4. This completed drop-spine box contains a book previously owned by J. J. Audubon; book conservation treatment was also completed.



Fig. 5. Each book was protected by a cotton flannel chemise.

#### CUSTOM-MADE STORAGE BOX USING CORRUGATED BOARD

The same L-shaped aluminum can also be used as reinforcement for custom-made boxes of alkaline corrugated board, which may be needed for very large items. The aluminum is laminated with paper, marked, and bent, and the corners are mitered as described above. Three walls with two corners are needed for the bottom of a drop-front box, four walls and four corners for the top. For the sample described here, acid-free E-flute corrugated board was used.

After the aluminum was bent and cut to dimension, the corrugated board was measured, cut, and scored to tightly cover the aluminum framework, thus avoiding the use of most adhesives (fig. 6). A single sheet of corrugated board can be used, or—for additional strength and rigidity—a second

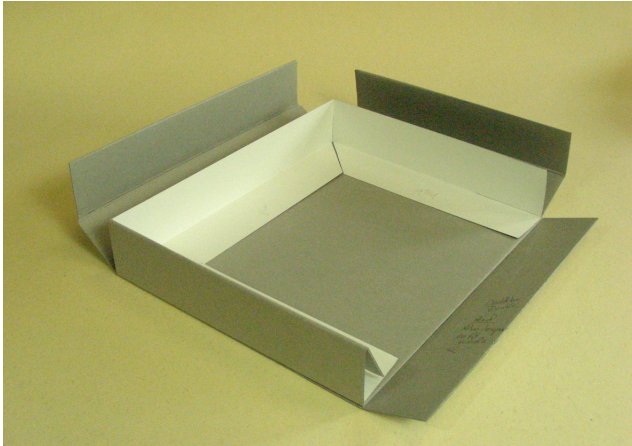


Fig. 6. This custom-made, corrugated drop-front box has aluminum-reinforced walls and corners. Two sheets of E-flute board are being used in perpendicular directions.

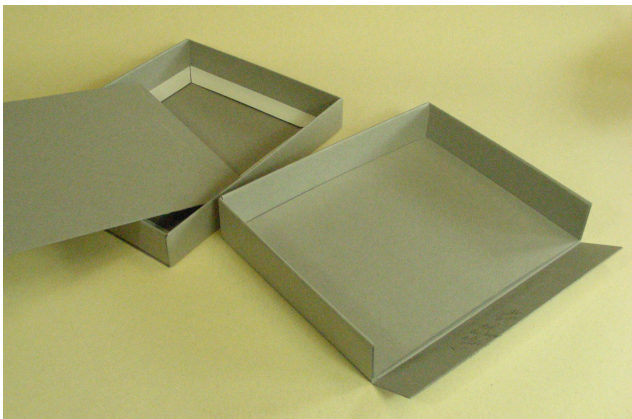


Fig. 7. The bottom of the drop-front corrugated box is assembled with three aluminum walls and minimal adhesive. The cover, made in the same way, has four aluminum walls and corners.

sheet with grain perpendicular to the first can be scored to fit over it. These sheets can be laminated for additional strength. The exact formulas for measurement will be familiar to anyone who has made boxes. The resulting custom-made box is easily assembled and should be very strong (fig. 7).

#### MATERIALS

- *Aluminum trim coil* is available from most building material suppliers. The laminated aluminum can be cut and bent locally by a building contractor or sheet-metal shop. Finished material is also available from the author.
- *Acid-free paper* stock of any weight can be used.
- *ColorMount heat-set adhesive* and *Vólara polyethylene foam* are available from many sources, such as Hollinger/Metal Edge conservation supply ([www.hollingermetaledge.com](http://www.hollingermetaledge.com)).
- *Cotton flannel*—8 oz. single-sided and Oddy tested—is available from Benchmark ([www.benchmarkcatalog.com](http://www.benchmarkcatalog.com)).

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