A BOX WITH A COVER

Several variations on the basic design are possible:

a. On an otherwise unfinished box the edges can be reinforced with strips of cloth. This is a utilitarian but rather plain solution.
b. On a box with reinforced edges the sides can be covered with paper. To maintain equal tension, the inside also has to be lined.
c. Cover the outside of the box with cloth, and line it with paper.
d. Cover and line the box with paper, without edge reinforcement.

A box without any kind of reinforcement will not be usable, because the scored edges will be too weak.

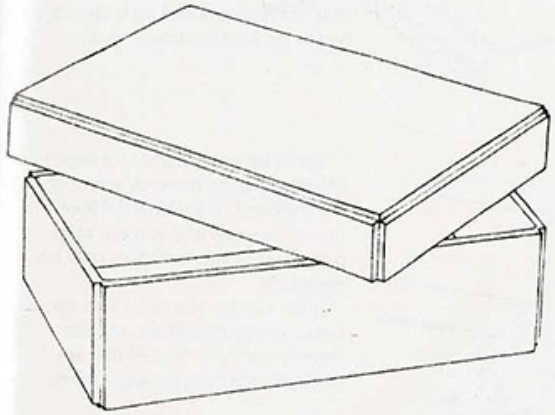
The box may be planned with a cover, a flap, a divider, or various compartments.

The choice of materials for coverings and linings must not be a mere afterthought. They influence the character and even the thickness of the board by their own weight. The color illustrations on pages 133–134 show some basic ideas.

The thickness of the board is otherwise a function of the intended use and the size of the box. Generally it will vary between 1/16 and 1/8 in (1–2 mm), but it is possible that special circumstances would call for a large and light box or a small and sturdy one.

You should always have a mental image of the object before starting work. Each detail can determine failure or success, and only a well-made object will be a beautiful one.

Only the most general hints can be given for the choice of materials to cover boxes. It is always possible to change your plans during the course of the work. It could turn out that a certain liner matches the finished covering better than the one originally intended. Continuity and perseverance are desirable, but so are flexibility and an open mind.



The heaviest paper that can be used is one that can still be handled with precision.

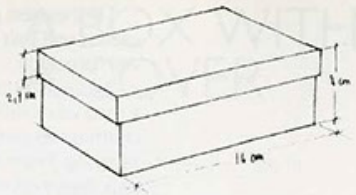
It is an unfounded opinion that a solid color makes a box seem unattractive and somehow less interesting. From the past there are countless examples of works of art decorated with colorful ornaments. These days, regrettably, we see little talent for ornamentation. I advise discretion, even if it means ignoring the counsel of those arts and crafts teachers and others who urge us to be free. Even with a choice of muted colors a box can come alive, whereas a splendidly mottled one could be utterly boring. This is not to be understood as a case against lively colors, only against their thoughtless use.

The lining material has to be pliable enough to be guided into inside corners. Delicate paper is practical to use only on small boxes.

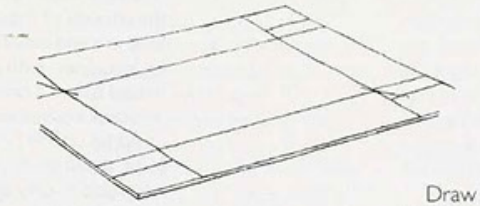
CONSTRUCTION

Flexible cardboard is preferable to brittle board. Many varieties are available either at arts and hobby supply stores or from bookbinding suppliers.

Sketch



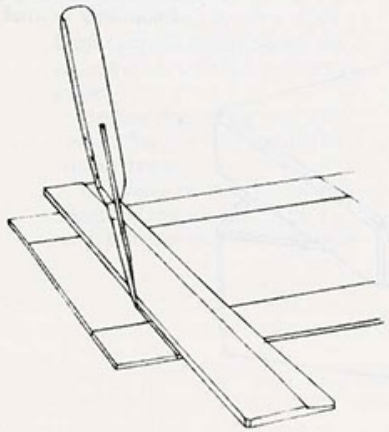
Start with a sketch of the box that you want to build. Decide on the dimensions and calculate the amount of material that will be needed. Grain direction is not yet important, but box and cover should be planned with the grain in the same direction. Some thought should be given to placing the pattern on the sheet with the least waste of material.



Pattern

Draw the pattern for the box in a right angle to the edge of the board and cut out the entire rectangle (see the chapter on cutting). Draw all construction lines on the smoother side of the cardboard. Indicate sides and hinge flaps of about ½ inch.

Cutting

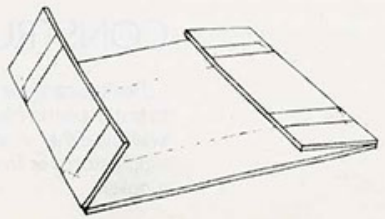


Scoring

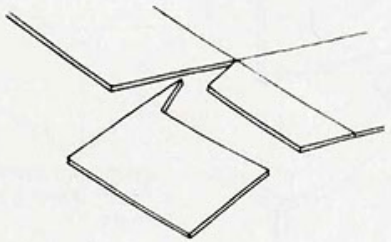
Score the four edges to a depth of two-thirds to three-quarters of the thickness of the board. Move the knife evenly and without stopping. Two or more strokes may be necessary.

If the score is not deep enough, bending may be difficult, and the board may crack. Scores that are too deep will result in weak joints.

Folding



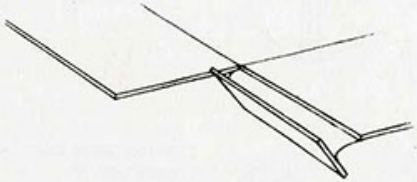
Fold up the four sides and push the bone folder along the newly formed edges, an often neglected but important step. The sides should not resist taking their new position, because some of the tension is removed by the bone folder. If this step is skipped, the sides will bulge out later.



Cutting out corners

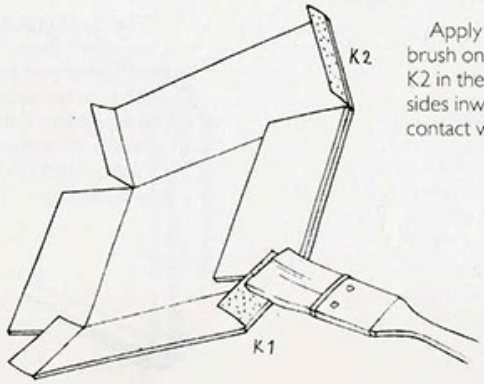
Cut out the corners using either a knife or scissors.

Splitting flaps



Hinge flaps should be as unobtrusive as possible. Split them by folding up the flap and forcing off the extra material. Fold up the sides to check that they are of equal height, and correct differences by refolding or trimming.

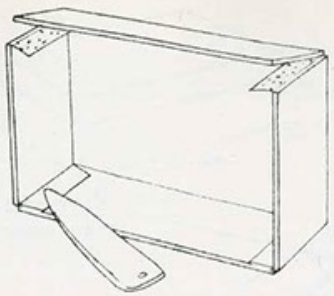
Gluing



Apply unthinned PVA with a flat brush onto the hinge flaps (K1 and K2 in the illustration). Fold the other sides inward to protect them from contact with the adhesive.

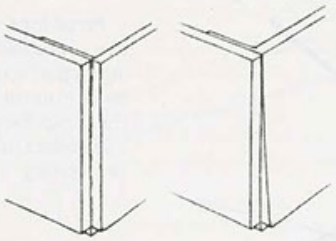
Gluing

Rubbing down

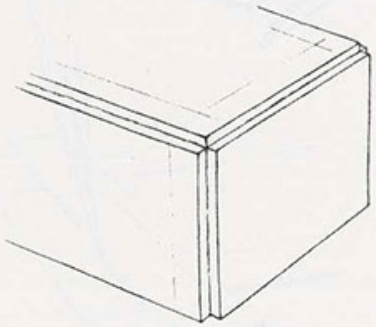


Attach the flaps to the adjoining side, adjust the position, and rub the parts together with the bone folder.

Gluing edges



A correctly made joint is shown in the left drawing, a sloppy one in the right.



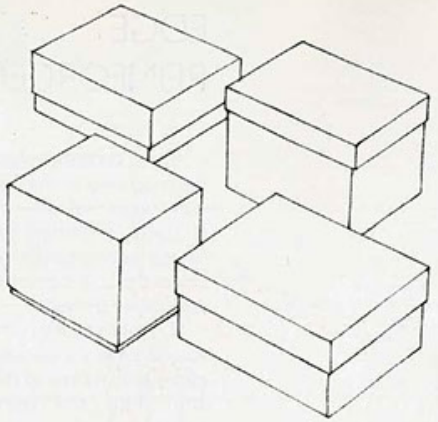
Drawing of a basic box construction.

Errors and corrections

The construction is now finished. Check it for flaws: Are all the corners right angles? Joints that have shifted can be repositioned, but if an inexact pattern is the cause of the problem, no correction is possible.

Sharp edges can be treated with fine sandpaper.

The cover

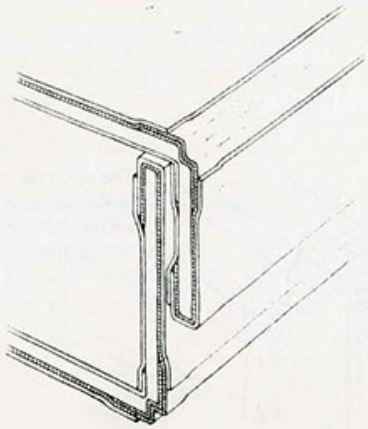


The construction of the cover corresponds to that of the box, except for slightly altered measurements. The rim, depending on taste and necessity, can vary in width. It may be as high as the box itself. Beginners are well advised to start out with proportions such as 1:3 or 1:4, since these seem to please the eye.

Fit

Measuring

To find the right fit for the cover is somewhat tricky. There should be a slight resistance against opening once the box is covered and lined. Measurements for the cover have to be taken from the total outer dimension of the box (A), not from the measurement of the corresponding side on the drawing (R). About 1/16 in (1–2 mm) has to be added to the measurement of the cover.



This drawing shows how the thickness of the covering material and lining can influence the fit of the cover. On a vertical side, we are dealing with two edge-reinforcement layers, two layers of covering, and one lining. The quality of the craftsmanship obviously will have an influence on the fit.

EDGE REINFORCEMENT

A box constructed according to the preceding instructions could not stand up to real use — its edges are too weak. They have to be reinforced with strips cut from cloth, unless the box is entirely covered with paper or cloth.

Some boxes are merely reinforced; others are covered with paper afterwards, so that only small strips of the reinforcements remain visible.

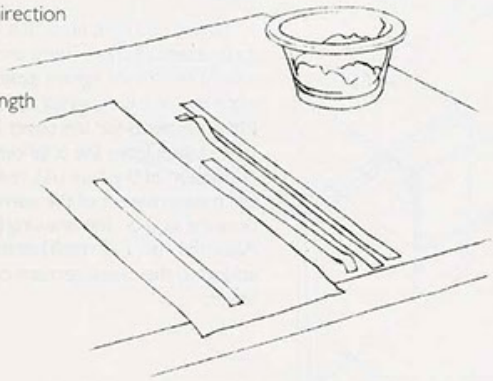
If you are planning to cover the box, the colors of the reinforcements have to be coordinated with those of the covering materials.

The width of the reinforcements should be about ¾ in (2 cm) and they should be cut parallel to the selvage. Cut the first two strips the length of the shorter edges of the box, plus the length of the two adjoining verticals and overlaps of about ½ in (12–15 mm) each.

Strip width

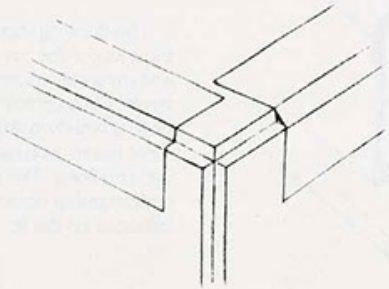
Grain direction

Strip length



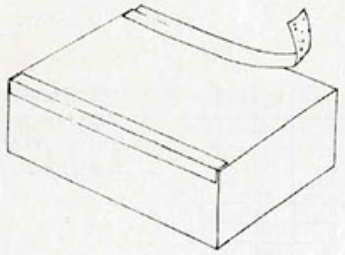
Set the strips out on newsprint and apply adhesive, using a 2:1 mixture of PVA and paste.

Two application methods



The strips can either be stretched over the edges or forced into the scores, which gives the finished box a more pronounced appearance.

Reinforcing the longer edges

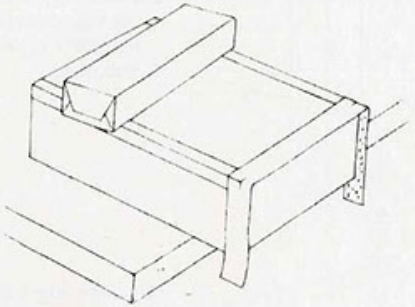


Glue the longer strips first. It is helpful to mark the position of the strips on the board, since the edge of a crooked reinforcement strip will be visible even through colored paper. Attach the strips in this sequence: Touch the strip to one side, rub it on gently, and fold it over to the other side.

The bone folder may leave shiny marks. To avoid this, place a layer of paper between it and the strip.

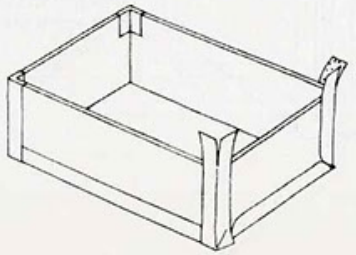
(Most of the drawings in this chapter are simplified in their presentation of edges for the sake of clarity.)

Other edges

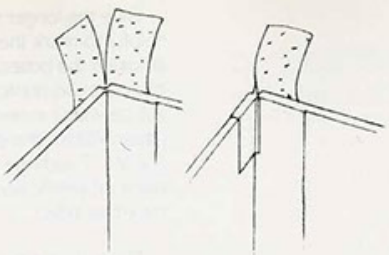


The other edges are reinforced as follows: Apply adhesive to the strip, touch it to the bottom edge, pull it around to the side, and rub it on.

Overlaps

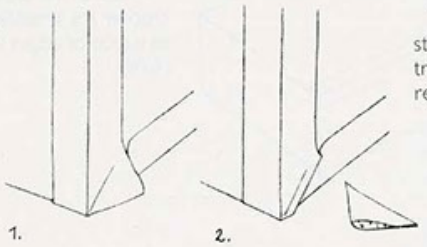


Make incisions at the corners, turn the strips tightly around the upper edges of the sides, and rub with the bone folder.

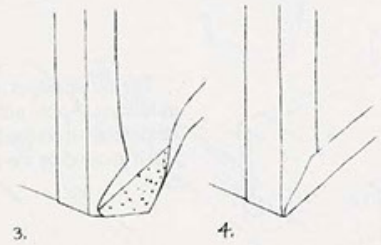


A detailed view of the upper corner.

Corner treatment

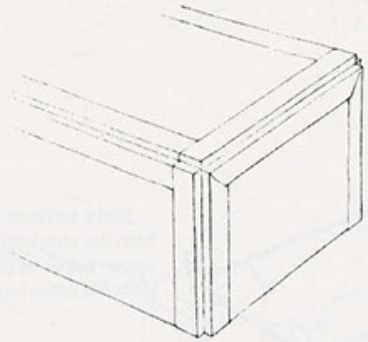


This sequence shows in four steps how the lower corners are treated. Note that the cuts do not reach the corner.



1. Push the strips together.
2. Cut off the extra triangle.
3. Lift the edges off as far as necessary to overlap.
4. Rub edges.

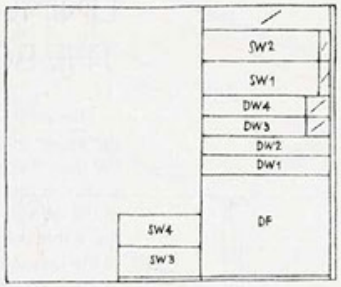
Finish



Rub all the edges and especially all the corners once more with the bone folder, to make sure that no spot has been overlooked. Check the box and cover in this way. The fit of the cover will of course depend on how carefully the components were made.

Visible edges

Pattern for cover



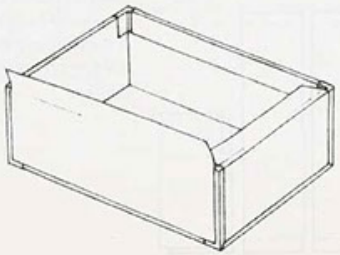
Grain direction

Expansion

Gluing

Setting on

Rubbing down



COVERING THE BOX

Each side of the box is treated separately. For the overlaps you need to allow about ½ in (12–15 mm) extra. Thin strips of the reinforcements will still be visible when the work is completed.

The drawing on the left shows a cutting pattern for the covering of a box and its cover.

First the right edge of the sheet is trimmed, then a section that matches the longest dimension of the cover is cut off. It contains the parts DF (top of the cover) and DW 1–4 (sides of the cover).

Since there is some material left, covering material for two sections of the box itself can be cut from the strips: SW1 and 2 (side covering). The remaining pieces of covering material, SW3 and 4, have to be cut from a new section. The bottom of the box will be covered with a different material.

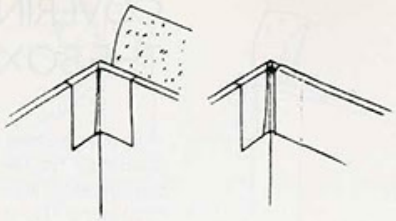
If the pattern is arranged so that the grain direction of the paper matches the horizontal lines, it will be easier to fold the overlaps. The covering for a box and its cover should always run in the same direction.

The covering material will expand and contract under the influence of the adhesive. To achieve inside rims of the same width it is useful to test the material first.

Using a 2:1 mixture of PVA and paste, apply the adhesive to one piece at a time. Position the covering material, rub it on, and fold it over the edges where necessary. If cloth is used, the rubbing has to be done with special care (see the chapter on adhesives).

Overlaps

Bottom



Covering the cover

With precise measuring, the overlaps of the covering material should match those of the reinforcement strips.

The bottom of the box is usually covered with a different and stronger material in a neutral shade that matches the rest.

As the last step, put the covering material on the cover.

LINING THE BOX

The lining counteracts the pull of the paper or cloth on the outside of the box. It covers everything but a small rim, along which the overlaps of the outside material remain visible. If the lining is omitted, the sides of the box will soon bulge out.

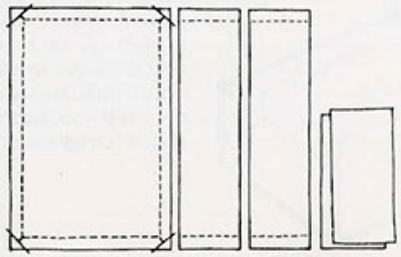
The lining is rarely exposed to view, but it should be installed with no less care than the covering material.

The lining paper should not resist being pushed into the corners, which limits its weight. Its color is not restricted to white: light-colored boxes especially benefit, often surprisingly, from the contrast that a dark interior provides. The colors of the future contents may provoke ideas.

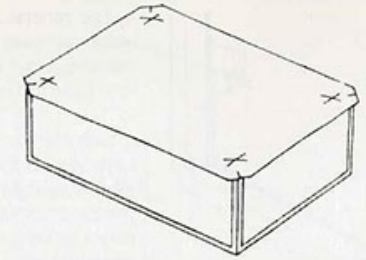
Color

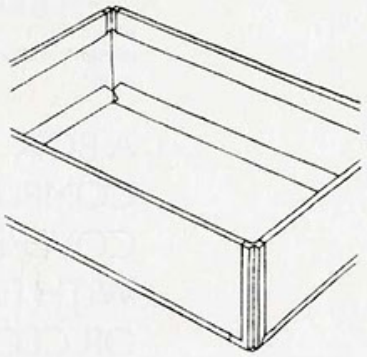
The inner dimensions of the box provide the measurements for the lining. Add ¼–½ in (5–10 mm) to two opposing sides, for overlap at the corners. The height of the lining strips should be ⅛ in (2–3 mm) less than the height of the box. A narrower lining strip shows too much of the covering overlap and looks bulky.

Lining patterns



Lining the bottom



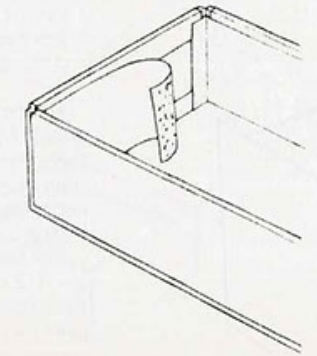


See how the four corners are beveled and cut. The cuts end exactly at the points at which the four corners of the bottom are located. The expansion of the paper should be considered as carefully as possible.

Apply adhesive to the bottom piece twice, place it on top of the box, and with four fingers push it down gently, taking care to keep it horizontal. If you used enough adhesive it should be easy to nudge the paper into the right position. Rub it down with movements radiating outward from the middle. The paper should lie flat with no wrinkles, especially in the corners (which may be a problem in deeper boxes), and no air bubbles should be trapped underneath. The answer to most difficulties is, again, the generous application of adhesive. The work cannot be saved if the paper sticks to the wrong spot at the wrong time.

To avoid adhesive stains at the upper edge of the box while the bottom lining is being inserted, you can finish this step before the outside is covered.

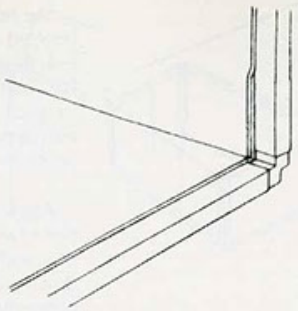
Lining the sides



Apply adhesive twice to the linings for the two longer sides and insert them. The overlaps onto the narrow sides should have the same height as the rest of the strip. No beveled or rounded corners! The bottom edge should meet the bottom of the box.

The last step is to install the lining for the shorter sides.

Even edges



Lining the cover

The general appearance of the work improves greatly if all parts that are visible at the upper edge look neat and even.

Line the cover in exactly the same way as the box. Be patient! Wait at least 2 hours before trying the cover for fit, otherwise, still-damp sections of lining may get scratched off.

With a large box, put blotting paper inside the box and cover and weight them down until dry. This prevents warping of big expanses of paper.

A BOX COMPLETELY COVERED WITH PAPER OR CLOTH

General considerations

A completely covered box is not necessarily sturdier than one with edge reinforcements, but it has, without doubt, a different character (see the color illustrations on page 135).

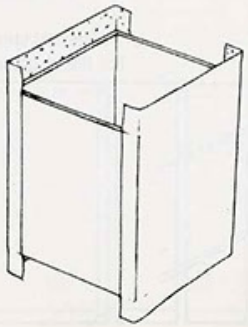
For reasons of stability, only smaller boxes should be treated in this way, but the possibilities for color combinations are endless.

Adhesives

Fabric or paper is attached with a 1:1 or 1:2 mixture of PVA to paste.

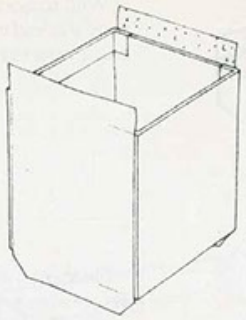
See the chapters about cutting and gluing if necessary.

Covering the box



For the box itself you need five pieces of the covering material. Cut them from the sheet so that the grain direction is parallel to the upper edge of the box, to facilitate folding.

The first two parts overlap about ½ in (12 mm) on all sides. First fold the sides, then the bottom, and lastly the upper edges. Treat the corners as described on page 116.

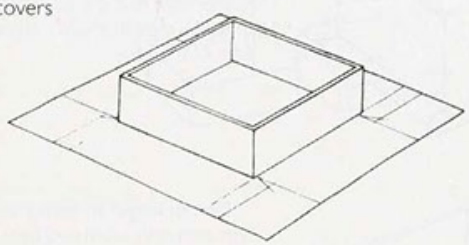


The other two pieces are ⅛ in (2–4 mm) narrower than the sides of the box, but they have top and bottom overlaps of the same width as the first pieces. The bottom corners are mitered at a 45-degree angle.

Cover the bottom of the box last, and use a piece that is 1/16–⅛ in (1–3 mm) smaller than the box bottom. Even though the bottom is rarely seen, the covering should match the other materials.

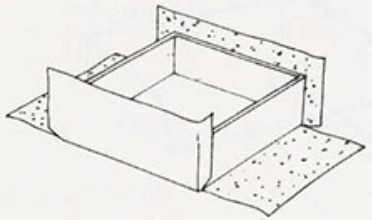
After all the overlaps are folded, rub all parts with a bone folder or fingers, then line the box as described on page 118.

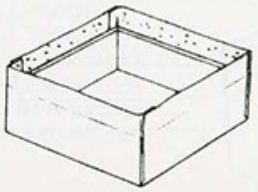
Shallow covers



Coverings for shallow covers can be cut in one piece. The illustration shows corners already marked. Adhesive is applied to the cover, which is then set onto the paper.

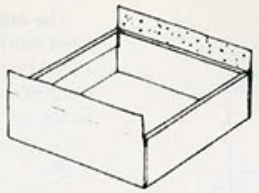
Note that the lines marking the longest cuts are not a continuation of the sides of the cover, but are placed 1/16 in (1–2 mm) inward.





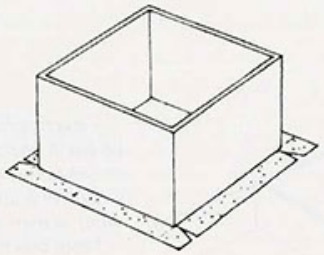
Cut the corners, paste the sides, and two opposite sides of the cover are completed. Do not forget to pinch in the paper around the corners after the overlaps are folded.

Now glue the other two sides and gently rub down the paper.

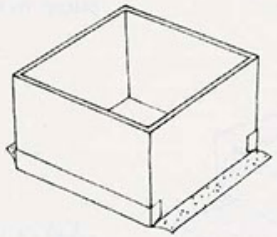


With scissors cut the corner sections and fold in the overlaps. The box is now ready for lining.

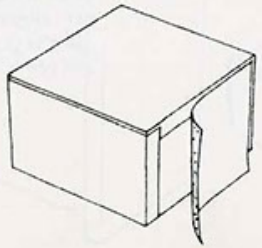
Deep covers



Deeper covers cannot be treated this way because it is not only a waste of material to cut the entire cover in one piece; it is also very cumbersome. Instead, cut a piece to the dimensions of the top of the cover plus ½ in (12 mm) on each side. Mark the position of the cover on it and apply adhesive to the entire piece. Place the cover onto it, rub on the paper, and cut out little triangles, as shown in the illustration. Remember that the points of the triangles are not exactly at the corners of the cover.



Do not forget to treat the corners correctly after two flaps are done before proceeding to finish the other sides.



This drawing shows the cover from the top. Two sides, usually the longer ones, are already finished. The third and fourth are just being covered. After completion of this step, the cover can be lined.

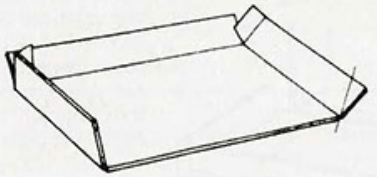
THE HINGED COVER

The construction of a cover with a hinge should present no difficulties if you have tried your hand at a regular cover. The drawing shows the differences:

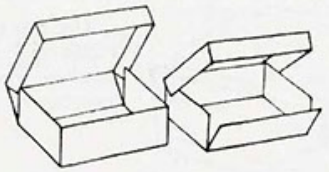
One long side is missing. The adjacent shorter sides are mitered at 60 degrees.

The construction of a box with four fixed sides is described on pages 109–113.

Construction

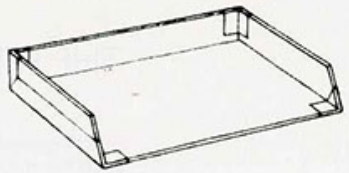


Combinations



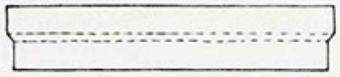
Other variations on the theme include a front that folds out, or a folding side attached to the hinged cover, which would be very similar to the hinged box that will be described later.

Reinforcements



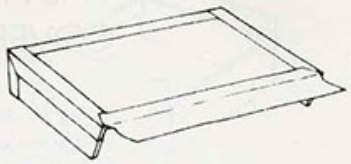
Let us assume that all edges are already reinforced. Connecting a cover or a folding side to the body of the box is a similar process.

Hinge strips

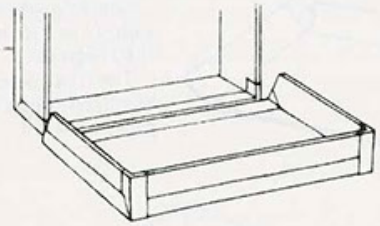


The outer and inner hinge strips have to be cut to fit the exact dimensions of box and cover. Remember to allow for shrinkage, since the strips are cut parallel to the selvage.

Attaching the cover

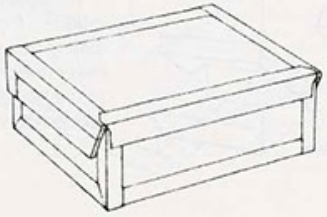


Apply PVA with a small amount of paste mixed into it and attach half of the strip to the cover.



Inner hinge strip

Now turn the cover upside down and attach the box. Stand the box on one side; its distance to the cover should be about one and a half to two times the thickness of the cardboard. Press it onto the fabric strip underneath, then close the cover and rub down the strip. Now open the box again and attach the inner hinge strip. Rub it down as described on page 126.



If the box is to be covered, this should be done after the cover is attached. The process is the same as for a box with a regular cover.

Scored hinges

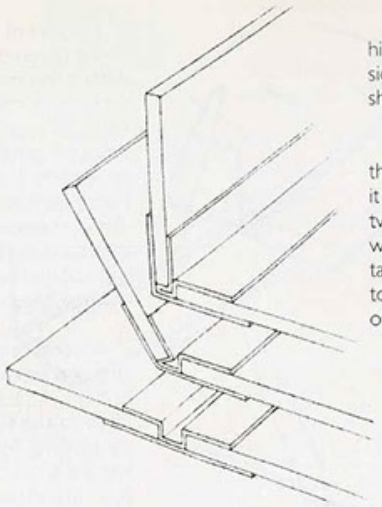
THE HINGED SIDE

A hinged side is recommended if the contents of the box would otherwise be inaccessible without turning the box upside down. Often the hinged side is combined with a hinged cover.

The hinge can never be replaced by a mere score. If the parts are to be functional, covers and sides have to be cut separately.

Height of flap

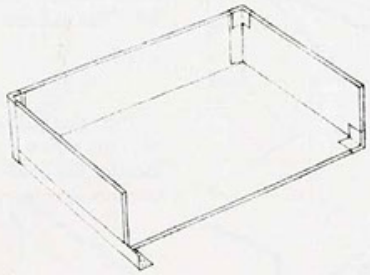
Length of flap



The drawing shows how the hinge works and why the hinged side has to be cut 1/16 in (1–2 mm) shorter than the other sides.

The length of the hinged side is the same as that of the entire box if it is supposed to rest against the two sides in closed position. Otherwise the length of the hinged side is taken from the length of the bottom, from inner edge to inner edge of the two sides.

Reinforcing box edges



Reinforce the edges on the box while it is still missing a side. See pages 114–116 for details.

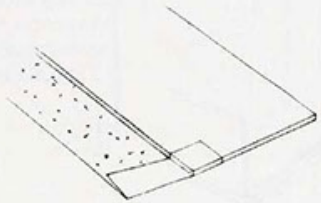
Connecting strips

Two strips of cloth will form the hinge. The outer one should be cut from the same material as the edge reinforcements, while the inner one should match the color of either the cardboard or the lining.

Cut the strips in selvage direction, with the necessary overlaps of ½ in (12–15 mm) each.

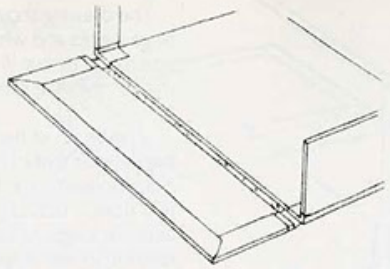
Set the side onto the strip and fold the overlaps.

Gluing the outer hinge strip



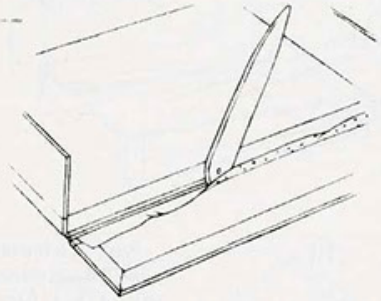
If a covering is planned, now is the time to cover the hinged side.

Connecting the flap

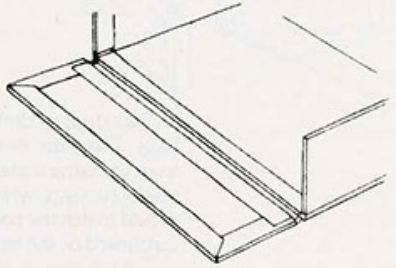


The part of the strip that is still free is covered with pure PVA. After a few minutes of drying time, set the box onto it. Remember to keep the edges at a distance of two times the cardboard thickness, and arrange the pieces so that the side edges are flush with each other. Turn the piece over and rub the strip carefully, but not until the area is supported with a block of wood to keep it from sagging.

Inner hinge strip

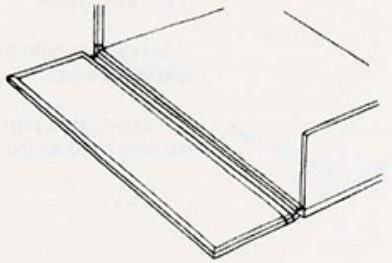


Apply adhesive to the inner hinge strip and set half of it down on the bottom of the box while holding the other half up to keep it from touching anything. Now press it gently into the score between the box bottom and the open side. No force should be used. If the bone folder does not slide freely, put a thin sheet of paper under it.



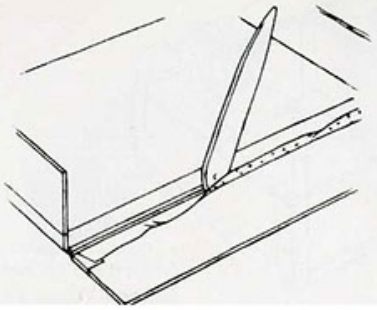
Then glue the rest of the strip onto the side. If a thinner cloth is used for the inside strip, the adhesive should contain more paste.

Lining the flap



With a paper-covered box, the last step after lining would be the lining of the hinged flap. Allow the newly constructed hinge to rest for 15 minutes before it is moved.

If you are a perfectionist, you can cover the free edges of the hinged side. This must be done before the



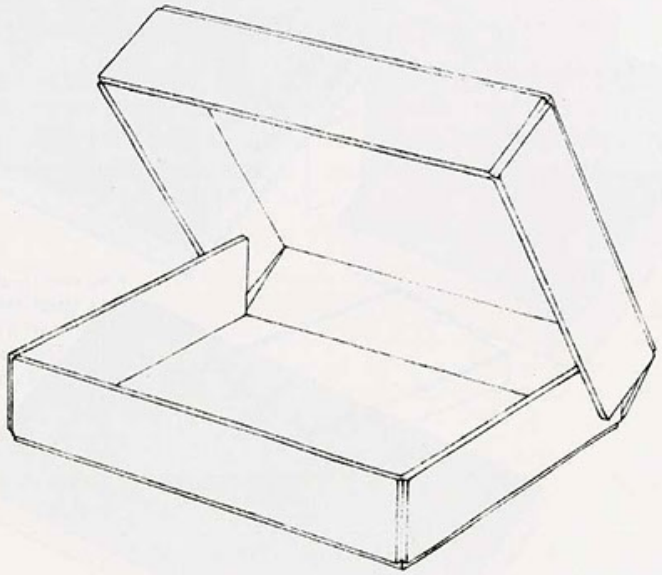
hinge is constructed. The little strips should be flush with the lower edge and have a ½ in (12–15 mm) overlap on top. The width is 1 in (2 cm).

THE HINGED BOX

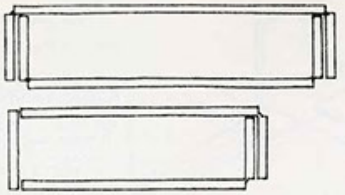
There is a close relationship between boxes with hinged sides and hinged boxes. Imagine that the cover of a hinged box is attached to the movable side, and that the sides of the cover are the same height as the sides of the box.

Many things can be conveniently stored inside: notebooks, photographs, postcards, mats, and so on. Items can easily be removed or shifted from box into cover, and, closed, the box can be stored upright on a shelf like a book.

The construction of such a hinged box should be attempted only after some practice with easier projects, because the steps that have been explained elsewhere are not repeated here.



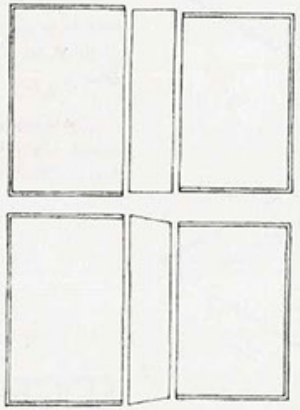
Side views



The two different views at left show how the box works. Bottom and cover are, except for their sizes, exactly the same, and their sides are the same height.

See page 113 for information on fitting bottom and cover together.

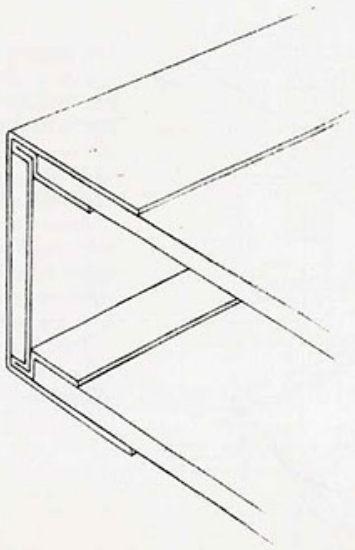
Rectangular or trapezoidal spine



These two drawings show variations in the spine of the box. Both are functional, but the rectangular spine is preferable if the box will be stored on a shelf.

A BOX WITH CLOTH SPINE

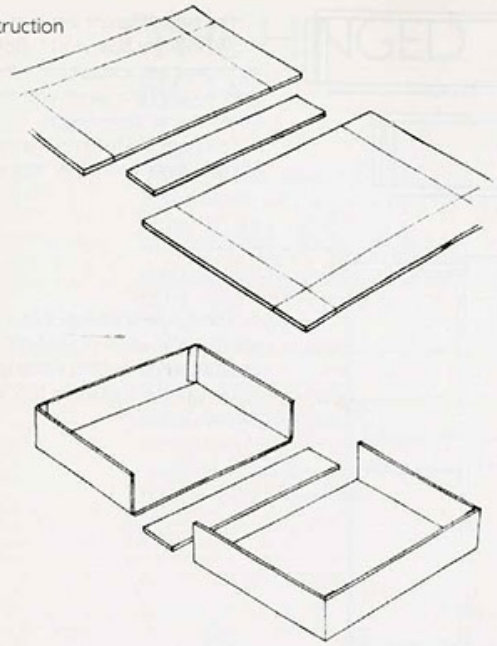
Detail of spine



CONSTRUCTION

Depending on the kind of cloth used, the back side or spine has to be about 1/16 in (1–2 mm) lower than the other sides (see page 125). Otherwise the construction is the same as that of a box with a hinged side.

Construction



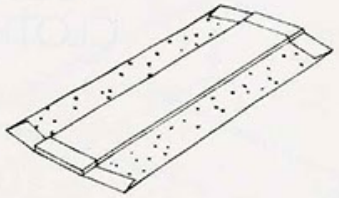
The length of the spine matches that of the cover. (In the case of the trapezoidal spine, the shorter edge corresponds to the bottom of the box.)

The drawing shows the three components before the sides of the box and cover are folded up. The exact measurements for the cover can be obtained only after the bottom has been constructed. See the chapter on boxes with covers for details.

The sides are folded up and glued. Then the edges are reinforced, as in the hinged box.

EDGE REINFORCEMENTS AND HINGES

Covering the spine

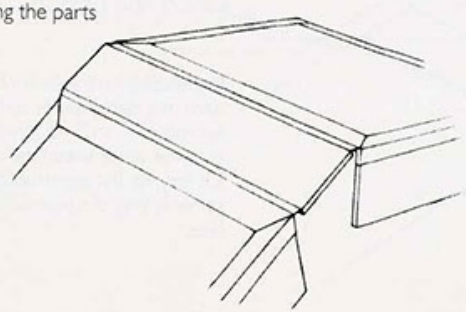


The drawing shows a spine that is already covered. The overlaps at the ends, shown folded over, are slightly beveled. The side overlaps are ¾–1 in (2–3 cm) wide. Use the same cloth for the spine as for the edge reinforcements.

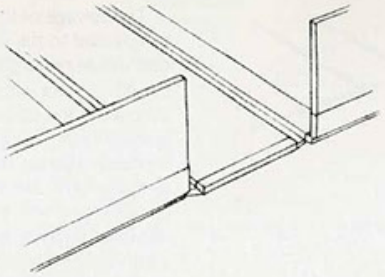
Apply unthinned PVA to the two folds and attach the box and the cover at a distance of one and a half times the cardboard thickness. Rub from the outside.

The distance of both parts to the spine has to be exactly equal. Weight the pieces and let them dry for ½ hour.

Connecting the parts



Inner strip



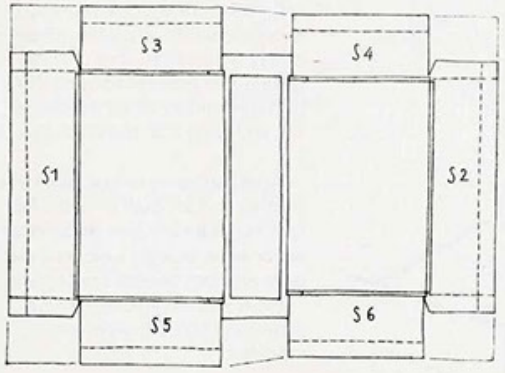
The last step in making a hinged box with reinforced edges is the application of the inner hinge strip. It strengthens the joint and provides countertension for the outer hinge strip. Cut it to its final dimensions before gluing it in. It is slightly longer on one long side than on the other because the cover of the box is slightly larger than the bottom of the box. First glue the strip to the inside of the spine. Glue it to the cover and bottom only after working it into the grooves between them (see the drawing on page 184).

If you are not planning to treat the box any further, make the inner strip of the same material as the outer one. But if covering and lining are to be added, the inner strip should match the lining.

Possible covering materials and linings are described in detail on pages 117–120.

Cover

Lining



Cover pattern

A HINGED BOX COVERED WITH CLOTH

This project requires considerable proficiency, and should only be attempted after you have made a hinged box with a cloth spine and cover, as well as a box with a cover completely covered with cloth.

The drawing shows the three parts of the box laid out on the precut cloth. The construction of the box itself has already been explained.

Selvage

Corners

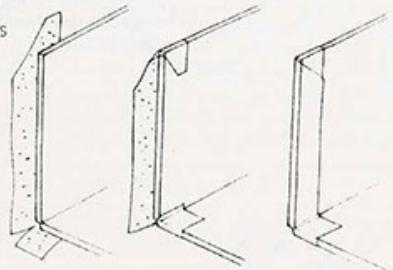
Expansion

Marking the position of the cuts

The selvage of the cloth should run parallel to the spine; the cloth is one whole rectangle. Bookbinders cut off corners and other leftover parts after the adhesive has been applied to the whole piece and the cardboard pieces have been set onto the cloth, because the reaction of cloth to adhesive is often unpredictable. It may stretch across the width and shrink in length up to as much as an inch per piece cut for our purposes. It is therefore a good idea to mark the cuts only lightly with a pencil.

It is best to allow ½ to 1 in (1–2 cm) in selvage direction for shrinkage. Cutting of excess cloth is easy — to work with overlaps of less than ⅛ in (2 mm) is not.

Covering the edges



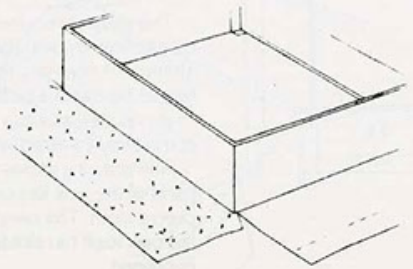
Before covering the sides, the four free edges next to the spine have to be covered. The edges of these strips will probably show through paper covering applied later, but you can diminish the effect by rubbing them down with the bone folder.

Applying adhesive

It may be difficult for an inexperienced person to apply the adhesive evenly onto a large area of cloth, but it is also possible to use a PVA-to-paste mixture of 4:1 instead of 1:1, and apply it to the cardboard.

Setting on

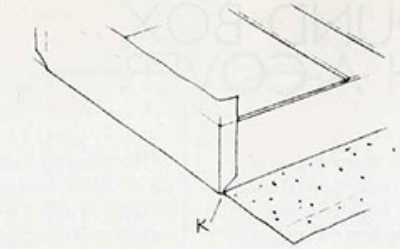
Cutting



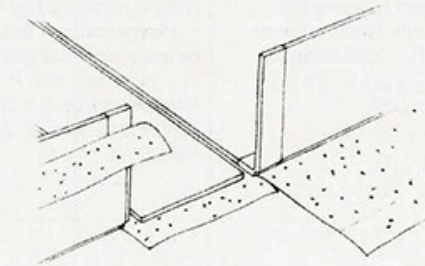
Apply adhesive to one piece after another and set each onto the fabric. Do not let any part of the cloth sag or hang, though; support it with large wooden boards if necessary.

Now you are at leisure to cut slowly and carefully wherever indicated.

Folding overlaps



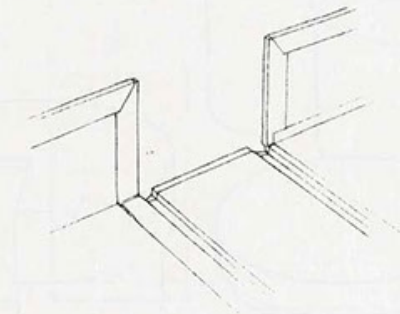
Glue sides S1 and S2 of the cover (see page 161) with a 1:1 mixture of PVA and paste. Do not forget to pinch around the four corners (K).



Next work on the sides (S3, 4, 5, and 6) and the overlaps at the ends of the spine, which is probably the most difficult step in this project. The cloth has to be worked into the joints with utmost caution. A very narrow strip of the overlap comes to lie underneath the edge of the box or the cover respectively.

Trimming overlaps

Inner strips



After this job is done, fold the remaining edges. Check, after making the cuts at the corners, to see if the adhesive has dried, and reapply if necessary. This is very important.

Unequal overlaps can be adjusted with the help of a straightedge and a sharp knife.

Start the lining of the hinged box with the cloth strip for the inside of the spine (see the drawing on page 183).

The material should match the color of the lining and has to be worked into the grooves very carefully. The strip exposes an area of about ⅛ in (2–3 mm) on each of the narrow sides of the spine. On the long side it overlaps ½ in (12 mm) as usual onto the edge of the box or the cover, and will later be overlapped by the lining paper.

Lining

The lining pieces are set down exactly on these hinge edges. The rest is executed according to the instructions on pages 118–120. The illustration shows the bottom lining already in place.