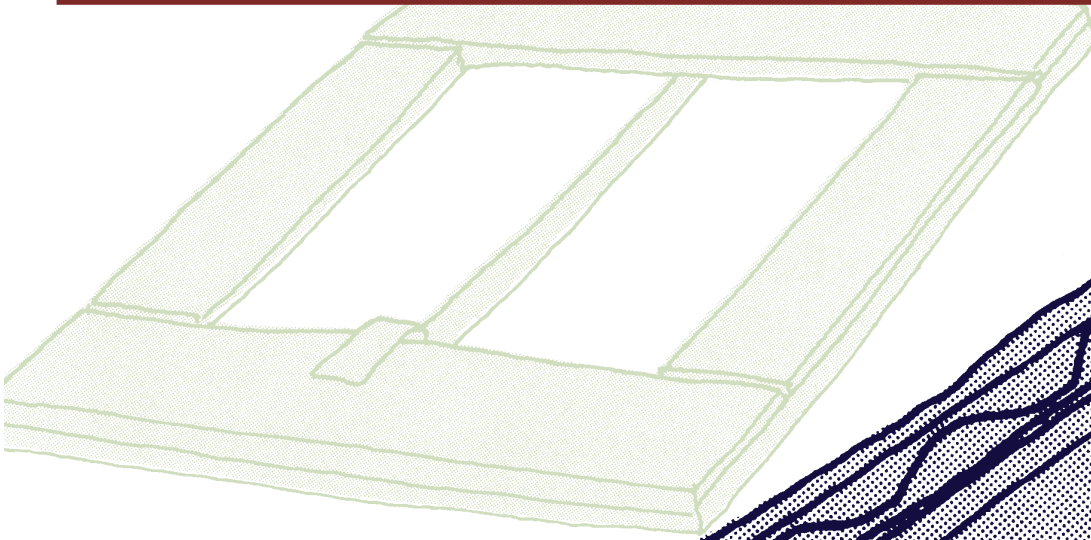


CREATING SPACE



for **Preservation Framing**



A Supplement to
Picture Framing Magazine
April 2004
by Hugh Phibbs

Preservation Supports

Spacers and Sinks

Introduction

The preservation of art requires the use of inert framing materials. This concern—the chemistry of preservation—has been, and should continue to be, vigorously addressed. Less attention has been paid to the physics involved in preserving delicate materials, however. The kind of space and support needed in order to successfully house works of art is not completely understood, but an investigation of this subject should begin with a consideration of the conditions in which cellulosic materials have survived for hundreds, in some cases thousands, of years.

The examples that come down to us from the Middle East and from western South America of materials that have been stored in cool, dry caves or tombs illustrate not only the benefit of stable, dark, temperate conditions, but also how a lack of handling and physical insult are important.

Since both cellulose and protein react strongly to changes in relative humidity, and since no frame can be expected to provide a climate as stable as a cool, dry, cave, the space in which the art rests and

the means used to secure it must accommodate the art's expansion and contraction caused by atmospheric changes.

Some of the best precedents for the preservation of paper-borne art are the prints and drawings that have survived in excellent shape after being bound in volumes for hundreds of years. Early European prints are very rare. Some survived by being pasted to the inside of box lids, others were placed in books; but too often they were nailed or stuck to a wall with sealing wax and were soon destroyed.

The appreciation of drawings as works of art in their own right and not simply preparatory studies for paintings began in the Renaissance. These drawings were mounted on larger sheets of paper, often with decorative borders added, and those sheets were bound into volumes. The papers used were made of linen and the adhesives were part of the traditional craftsmanship of the time. The support that this afforded the drawing was steady and overall. The mount page was physically sympathetic with the paper on which the drawing was executed. If the edges of the book were gilded,

the drawings were even further isolated from pollution and environmental flux.

As these drawings were taken out of their volumes and placed in frames, they were endangered by their new proximity to wood and glass. They had neither the mass of paper that the books on a library shelf would comprise nor the stabilizing effect that mass would have against changes in relative humidity. The single sheet, trapped alone between glass and a wooden shingle, would degrade quickly.

In the mid-19th century, the window mat was developed at the British Museum. This gave some of the protection that the volume had afforded. The matted print or drawing was stored in a box or cabinet and was exposed to light only when it was occasionally displayed in a case. European matting tradition often involved attaching the art to a larger sheet of paper similar to its own; this larger sheet was then attached to the mat. This perimetric attachment has been replaced in North America by the practice of hinging the art to the back mat.

Since most art on paper cannot be expected to have the same reactions to humidity as four-ply board would, the hinges used to attach it must mediate this difference. The window mat is a useful tool when it overlaps the edges of the art, since it provides gentle, steady support. Yet



Hugh Phibbs, Preservation Editor, is the coordinator of graphics conservation services in the Department of Exhibitions and Loans, Conservation Division, National Gallery of Art, Washington, D.C. He has taught workshops for the National Conference, the AIC, PPFA, the conservation programs at Winterthur/University of Delaware, and the Smithsonian Resident Associates Program. He also compiled the matting and framing section of *The Book and Paper Group Outline*.

a four-ply board only affords $\frac{1}{16}$ " separation between the surface of the paper and the glazing; that interval is not likely to be sufficient to hold the art away from the glazing. Adding additional mats will increase the separation, but only at significant expense. Adding a spacer to the outer edges of the window can add space between the art and the glazing, but it lessens the hold that the overmatting portion of the window provides.

Anyone who has centered a work of art in a window mat knows that the art cannot be moved unless the window is lifted off the surface of the art. The friction between the window edge and the art provides a gentle and steady support that can be maintained if the mat is made multiple or is deepened. If a spacer is added to the edge of the mat, or if the work of art is floated in a mat, the utility of the window is lost.

The framing of contemporary art often employs a spacer at the edge of a back mat on which the work has been floated. In such a housing, there is the potential for light to desiccate the front of the art while the verso may be humidified by proximity to environmental moisture, contributing to the possible cockling of such works. Like the drawings removed from their volumes, it has no surrounding paper to help condition its environment. Floated works lack the support of overlapping mat edges and need more hinges than overmatted ones. The extra hinges tie the art more closely to the back mat, which can also pose problems of deformation for the art. Art that is floated in a frame must be watched carefully to monitor its condition.

One use of spacers that can be counted on to deform a work on paper is the placement of spacers on top of the edges of the sheet. The

paper cannot adjust to changes in humidity if it is trapped under the spacer. Even a spacer made of inert material would not be suitable if used in this manner. Art that has been made on board and is too heavy for hinging may be supported by specially configured spacers, but art on paper must be kept away from the spacer. Placing the art under the spacer would also bring it too close to the frame.

In designing a frame with a spacer, it is important to keep sight of the role that the spacer is to play. The glazing must be kept separate from the art, whether it is glass or acrylic. Moisture condensing on the glazing could wick into the art and cause cockling or tidelines if the space is inadequate. Photographic or acrylic emulsions can even adhere to the glazing in a process known as ferrotyping. Proximity to the glazing will cause friable medias such as pastel, graphite, or charcoal to transfer, especially in the presence of static electricity.

Another problem caused by proximity between the art and glazing is the production of accretions on the glazing surface. The whitish images that can be seen on glass removed from old frames has been found in some cases to be sodium chloride. Although the source of this material is not clear, it is probably caused by a process that is not beneficial to the art. Powdery accretions have also been found on the inside surface of acrylic glazing where it has been in contact with art. This, when analyzed, turns out to be acrylic that has been abraded to a powder by the art. This too poses a problem for the art.

These hazards make the benefits of separation of art and glazing evident. One of the first questions that must be asked is: How far should the art be spaced away from

the glazing? This is usually answered by the frame, since very few allow for a large space. In most cases, the largest space is safest, since the paper is not likely to stay flat and may drift forward. One exception may be presented by very thin papers that may be strongly pulled forward by static. When the paper is clinging to the acrylic it can be difficult to remove, and unframing may be problematic. In most cases, however, more space is beneficial and the means to create this safely are an important part of preservation framing.

Fundamental Spacer Construction

The most commonly used materials for making spacers are plastic and wood. Stable plastics such as polyester, polypropylene, polyethylene, and acrylic can be used to make successful spacers. They can also serve as partial barriers between the art and the wood of the frame. The means used to secure them in the frame package are very important. Those that clip onto the edge of the glazing will not come loose and can give some impact resistance to glass. Adhesion of plastic spacers can be difficult. They cannot be bonded with most water-based glues. If pressure-sensitive adhesives are used, they will give the best bond if the spacer is attached to the glazing.

Pressure-sensitive adhesives present two problems. Because they are activated by pressure, they can be slowly dislodged by the pressure of gravity. Too often, such spacers are found falling down from the tops of frames and a very difficult unframing process results. As these adhesives age, they oxidize and lose their tack. This problem is less severe when plastic spacers are

adhered to the glazing since less air can reach the adhesive. The same would be true of spacers adhered to a metal frame. Oxidation is more of an issue when the spacer is made of paper or wood since both materials permit greater quantities of air to reach the adhesive. Plastic spacers can be made of inert polymers and may bond well with pressure-sensitive adhesives, but they cannot be attached with water-based adhesives that will give a truly permanent bond. Wooden spacers can be permanently bonded with PVA glues but they cannot be considered inert.

Inexpensive, attractive, and easy-to-use spacers can be made from conservation-quality matboard or corrugated board made of similar material. One of the simplest spacers of this type is created by laminating acid-free corrugated board to the four-ply matboard (see Figure 1). A pure PVA glue will bond these boards very well. Once dry, the composite board can be placed on a wall-mounted cutter with the four-ply side exposed. A

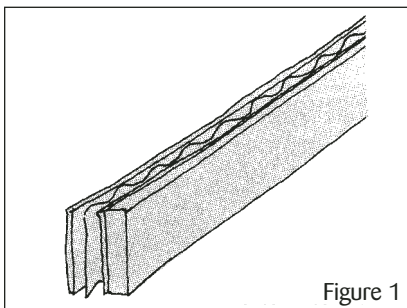


Figure 1

stop affixed to the channel that holds the board can be used to regulate the width of each spacer. The operator uses the board cutting blade to split the material and should be able to create neat strips in two or three easy passes.

Such spacers may be attached to the edges of the glazing with a couple of layers of tape. This can be laid out in a pinwheel fashion (see Figure 2) so that each abuts its

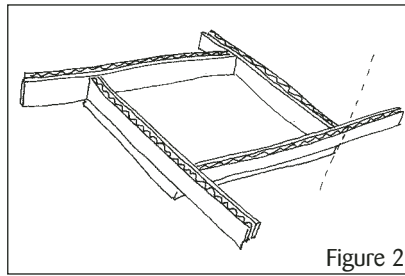


Figure 2

neighbor at one end while the portion that extends beyond the glazing at the other end can be trimmed away. The first tape layer is double-sided tape set between one edge of the spacer and the edge of the glazing. An additional layer of pressure-sensitive tape, which encloses the outside of the spacer and the front edge of the glazing, can be added to improve the strength of this spacing structure (see Figure 3). These spacers may also be glued to the side of the frame, once the cleaned glazing has been installed, but this strategy means that the glazing/back mat/backing board cannot be taped

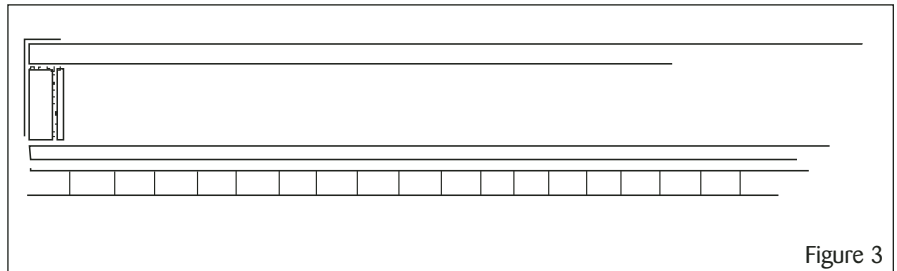


Figure 3

for dust exclusion.

If the spacer is used in a frame that will house the art for a number of years, the spacer should be modified so that it will not fall if the adhesive ages and fails. Four to five mil-thick polyester sheet can be bonded to the paper with PVA glue if the sheet is first sanded. The

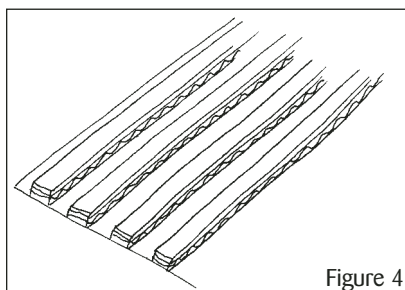


Figure 4

spacers can be glued to a large sheet of sanded polyester (see Figure 4) so that they are parallel and evenly spaced. When the glue is dry, they can be trimmed along one edge, leaving enough on the other side to overlap the edge of the glazing. This can be adhered to the edge of the glazing with an acrylic double-sided

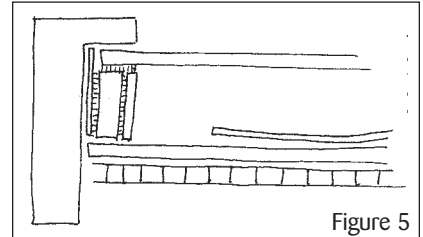


Figure 5

adhesive; any excess polyester can be trimmed (see Figure 5).

If one does not have acid-free corrugated board, one can substitute polystyrene and paper board for it. Since the long-term use of polystyrene in proximity to delicate materials is not fully understood, sealing that plastic is a wise idea;

this can be done with acrylic paint or gesso. The gesso has a high volume of solids in it, making it useful in two ways. First, those solids help to increase the isolating capacity of the paint layer, and second, as the paint settles into the holes in the foam, it stiffens the board and makes the spacer easier to install. If the foam-type board is used, it is simpler to fashion the spacer without an added layer of four-ply board, unless both will be painted. The gesso can be tinted so that it approximates the color of the back mat, creating an aesthetic

whole.

If a wooden frame is being used, a paper spacer can be adhered to the frame with PVA for a permanent bond. This will not completely seal the wood, but the combination of boards and their adhesives should help. Whether the spacer is attached to the glazing or the frame, the glazing should be thoroughly cleaned beforehand. If a spacer is to be attached to the back mat, it should not be glued permanently to the surface, since this would make it difficult to hinge the art during the framing and difficult to remove it during the unframing. The only safe way to attach a spacer to a back mat is with a linen tape hinge that extends from the back of the back

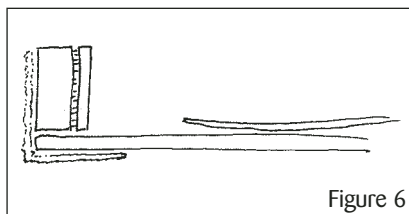


Figure 6

mat to the outside of the spacer (see Figure 6). This will allow the spacer to fold up and down for access to the art.

Combining Spacers and Window Mats

Another strategy is to combine the spacer with the window mat. This combination presents a problem: since the window will not be kept under gentle pressure by the glazing as it usually is, it can warp, forming a dangerous paper bevel onto which the framed item can drop during an accident. This concern is not theoretical, and anyone who has seen enough frames that have been fitted with such combinations is likely to have encountered such warping of the window.

There are ways to alleviate this problem. The window can be

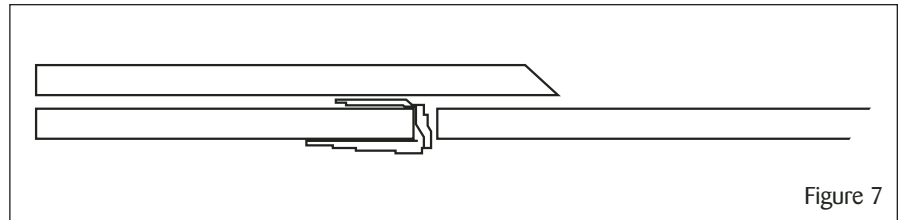


Figure 7

secured to the back mat with lashes of linen tape that are affixed to its back side and are then threaded through slits in the back mat so that they can be taped to the back side of the back mat (see Figure 7). The number of lashes needed will depend on the size of the window, but one every six inches should suffice.

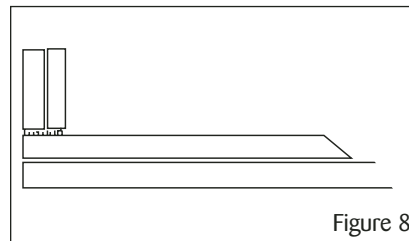


Figure 8

Another strategy requires gluing the spacer to the outer, front edge of the window mat. The presence of the spacer on the edge of the window will add some support for the window's board (see Figure 8). The spacer can be glued with PVA glue to ensure a lasting attachment that will not weaken over time. One edge of a spacer can be coated with the glue and then set along the edge of the mat, far enough from one corner that the next spacer can occupy that space and extend off the edge of the window. This creates a pinwheel pattern that ensures that the spacers fit (see Figure 9). When

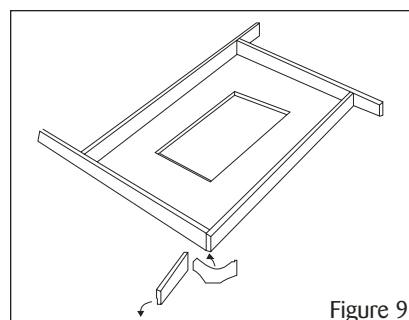


Figure 9

the glue is dry, the excess portion of each spacer is trimmed off and the outer surface of each corner is reinforced with a piece of linen tape. The creation of the L-shape structure by the junction of the window and the attached spacer will make the window more rigid and less likely to warp away from the back mat.

The use of a water-activated glue in this last example (instead of pressure-sensitive tape) is an important example of the greater longevity of bond of one adhesive over another. A loose spacer is a very dangerous part of a frame package and experience has shown that wooden spacers that are affixed to wooden frames with pressure-sensitive adhesives have a history of bond failure. Wood is porous and allows oxygen to penetrate the area of bonding. The inherent instability of the adhesive renders its bond vulnerable to this oxidation.

Pressure-sensitive adhesives used to apply an acrylic spacer to glass or acrylic should stay in place much longer, since the plastic of the spacer and the plastic or glass of the glazing will do a much better job of keeping oxygen and pollution out. One can combine pressure-sensitive adhesive and glue to ensure that the spacers will have both immediate tack and long-term bond.

Using Sink Mats

Floating a work of art on paper in a frame with spacers entails physical demands of the paper that overmatting does not, since the window mat supports and restrains the art. As the paper on which the art has

been made grows thicker, its weight becomes a factor to consider. When the art has been done on board rather than paper, the possibilities for safely floating it in a frame are diminished. Two-ply board might survive on reinforced hinges if the frame is handled very carefully, but four-ply board is heavy enough that it is likely to be dislodged from its hinges by ordinary handling. Such thick works of art are best housed in

sinks that can be overmatted.

The sink is a recess in the back mat that has been created to fit the dimensions of the art. The simplest can be made of scrap conservation-quality board that is glued to the back mat with PVA glue and built up to a depth at which its surface is co-planar with the surface of the art. The sides of the sink should be set out slightly from the edges of the art to allow for expansion of the art

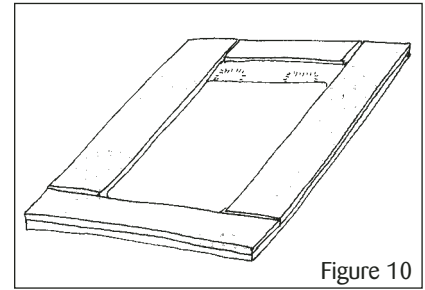


Figure 10

board in higher humidity, if the art is made of paper. If the art is created on metal or plastic, thermal expansion and contraction may be a greater concern.

If the art is on paper-based board and hinges have been added to its upper edge, either the opening in the sink (see Figure 10) should be enlarged so that hinges can be attached to the back mat, or the sink's upper side should be hinged so that it can fold down over the hinges (see Figure 11). The presence of the hinges and the friction between the overmat and the paper

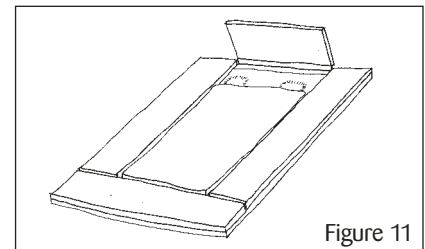


Figure 11

of the art will permit more space around the object than would be possible with a work on plastic or metal—which could not be hinged, would weigh more, and would expand less.

Another essential feature of any sink is the lifter. This is usually a strip of conservation-quality paper that is attached to the back mat under the upper edge of the sink and that extends under the object and up onto the front of the sink.

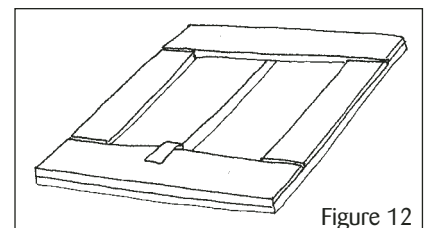


Figure 12

When it is lifted, the art is raised up from the sink and can be safely taken out. If the lifter is attached under the sink (see Figure 12), it can be glued with PVA. If it is attached under the art, paste should be used. If the object being housed is made of metal, the paper should be acid-neutral since an alkaline paper may react with some metals. If strength is needed, spun polyester can be used for the lifter, which should be attached with PVA under the edge of the sink. It is helpful to write a note about the proper use of the lifter on the sink so that anyone opening the window will not attempt to use a sharp object to remove the art.

One of the most common mistakes in the housing of art in sinks is the adhesion of the window to the front of the sink. This may be done with glue or with pressure-

sensitive double-sided tape. In either case, this practice should be avoided. The attached window is extremely difficult to remove and usually has to be torn apart to avoid injury to the art. This is always hazardous and alternative means of securing the window that can be reversed are very helpful. One simple method of affecting this employs strips of linen tape that are attached to the window, passed through the back mat, and taped there.

Once the sink has been assembled, with the window hinged to the front of the sink along its long edge with linen tape, slits in the sink can be cut. These can be made with two arc-shaped intersecting cuts that open an area more than an inch long. A slit can be centered along each side except that which has the linen spine. They should be roughly $\frac{1}{4}$ " away from the edge of the sink.

With larger objects, more than one slit can be used per side.

Once the slits have been completed and their centers removed, the sink and window should be turned face-down so that a blunt blade can be inserted into the slits and used to emboss the back of the window to indicate the points where it meets the slits. Strips of linen tape should be cut across on a long diagonal so that an inch or two of uncut tape remains at each end. This will create strips with long points that should be folded at the base of each point. These should be adhered to the back of the window so that their folds align with the embossed marks.

Once the strips are dry, the object can be installed in the sink and the tapes can be threaded through the slits and secured to the back of the sink with tabs of linen tape (see Figure 13). This closure will be strong and long-lasting but simple to reverse. A note on the back of the sink will help anyone

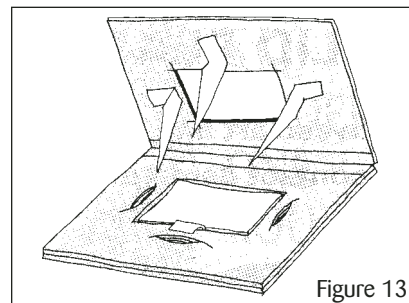


Figure 13

who is unloading it, especially if the unframing is done in the proper, near vertical position. Even if the tapes are mistakenly cut, they can easily be replaced and the sink secured again with fresh tapes.

Special Concerns for Artworks on Board

Such a sink can accommodate most objects that have been created on board, yet boards that have become degraded and brittle may require more elaborate sinks. These

boards are one of the most hazardous types of objects that may be presented to a framer—this material can fracture even with very gentle handling, and the problem is compounded if it is warped. If such an object is placed on a loose sink to prevent pressure, it may allow the art to shift and vibrate to a point that will injure it. If a sling of lightweight tissue is added to such a loose sink, it can gently cradle the object without any dangerous pressure.

This sink should be made so that it is shallow enough that the board will extend above it at some points and allow the object to be secured by its edges. Once the sink is created, vegetable starch paste should be brushed on its face around the opening. Lightweight tissue should then be laid across the opening to a sling to cradle the object. A piece of board that is the

same size as the object should be formed so that it has the same shape. This formed board should be pressed into the tissue while the paste is still wet so the tissue will take a shape that matches the back of the art object. The edges of the tissue should be pressed into the still damp paste and the excess trimmed.

Once the tissue is dry, the art board can be secured in it with edge strips, corner supports, or a shaped board insert if the corner is one in which the art is below the surface of the sink. The window mat must also have a sink or shim built onto its

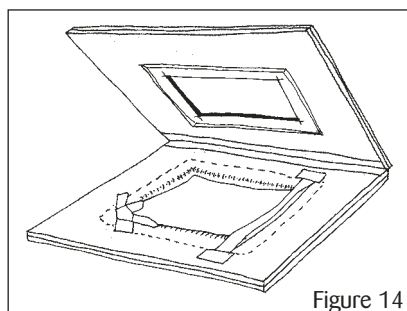


Figure 14

back side to accommodate the portion of the art that extends above the surface of the sink (see Figure 14). This sink requires a good deal of labor, but it can house very delicate objects.

Also problematical are boards on which art has been created in pastel, chalk, or paint that is flaking. These boards may be too heavy for hinging and would suffer abrasion if a spacer rested on its front edges. If such an object is housed in a window mat, it can be secured to the back mat while a shim on the window or a sink hinged to both the window and the back mat can accommodate its depth.

The board is secured to the back mat with an edge wrapper created from a sheet of Japanese tissue or lightweight spun polyester, sized to be roughly one inch larger than the art on all sides. The tissue is cut parallel to the edges of the object and $\frac{1}{4}$ " to $\frac{3}{8}$ " away from it. The cuts will extend out at the corners along a line that would

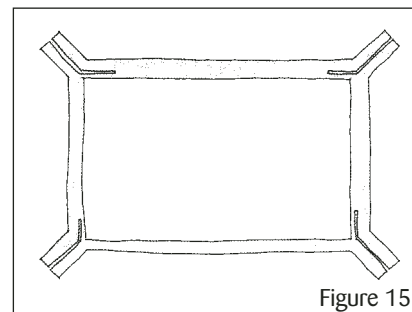


Figure 15

bisect the angle of the corner. This will create a piece larger than the art with tabs extending out from the corners (see Figure 15). The board should be removed from the tissue or polyester and another set of cuts made that will bisect the tabs. These cuts should be extended along the sides of the board, proceeding up from the bottom corners and in along the top of the board from the upper corners. The board should then be replaced on the sheet of cut tissue. The corner tabs should be

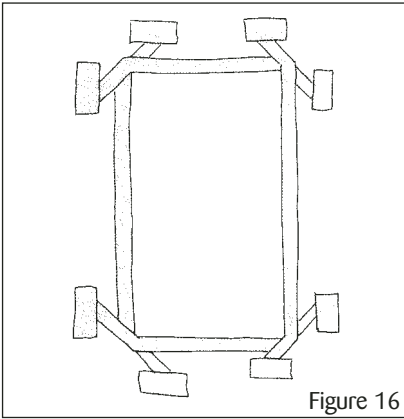


Figure 16

laced through the slits in their neighboring tabs so that the tissue enfold the edges of the board and eight strips extend away from the corners (see Figure 16). These strips can be attached to the back mat once the art has been properly positioned and the sink housing will be ready.

Support for Art in Historic Frames

Often, such drawings or paintings on board may be found in historic frames that have no mats and come up to the edges of the art. Separating a work of art from an original or historic frame would be an art historical disservice. It is best to keep them together while protecting the integrity of the art with minimal modification of the frame. Since these frames are usually made with little allowance for the art, some rabbeting will be necessary to accommodate the rehousing. These objects are usually fragile and have delicate surfaces. The structure that houses them should provide gentle support without abrading

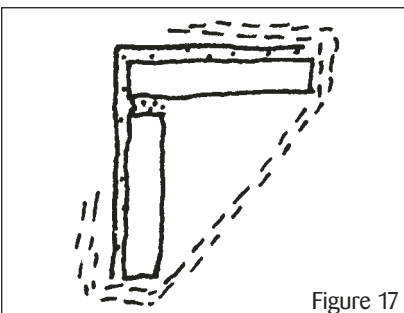


Figure 17

their surfaces.

Such a support begins with a back mat larger than the art in all directions by a distance roughly equal to the thickness of the art board. A spacer should be made by cutting strips of four-ply conservation-quality board into strips $\frac{1}{4}$ "

wide. Pairs of these are glued together with pure PVA glue to form Ls. These Ls should be reinforced with L-shaped pieces of sanded polyester sheet that are glued to the outside of the board Ls with PVA. When this is dry, a strip of Japanese tissue should be stretched

across the open or concave side of the Ls to form the hypotenuse of a right triangle. The tissue is glued to the outside of the legs of the triangle, also with PVA (see Figure 17).

This spacer should be secured to the outside edges of the back mat with linen tape that is adhered to

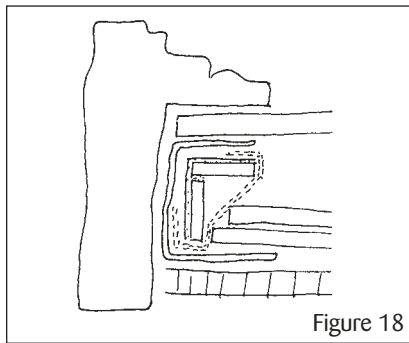


Figure 18

the outside of the spacer and around to the back of the back mat (see Figure 18). This allows the spacers to fold up around the art without pinching it. It holds the art through the contact of the stretched Japanese tissue with the front edges of the area without touching the front surface. The corners of the spacers can be mitered or butt-joined and each secured to its neighbor with narrow strips of linen tape. This creates a tray-like support that can be readily inserted into the rabbeted out frame.

Spacers for Oversized Works

As the physical nature of the artwork changes, the means used to support it and keep it away from the glazing must change too. The size of some contemporary works of art has grown to such proportions that special spacers may be needed to house them safely. When artists make prints and paintings on the largest size of conservation-quality board that is made and they use the entire board, they tax the limits of

the ingenuity of preservation framing. Such works are too heavy to hinge, and overmatting them would require piecing a mat together and would make the final package so large and costly as to become impractical. These factors may justify the use of a spacer that comes closer to resting on the surface of the art.

If such oversized works of art are to be framed, using a frame that comes over the edge of the art will limit the size of the package and make its cost more realistic. Such a frame will need extra allowance to permit the board on which the art is made to expand. Any such frame should be scaled up for a number of reasons. It should have extra depth to permit more space between the art and the glazing and for the strainer needed to strengthen it. It will need a wider lip to ensure that the glazing will not be dislodged if the frame is flexed as it is moved. This enlarged lip permits the use of a thicker spacer. This begins as a combination of conservation-quality four-ply and corrugated board. A layer of sanded polyester sheet is glued to the outside of this combination and a strip of heavyweight,

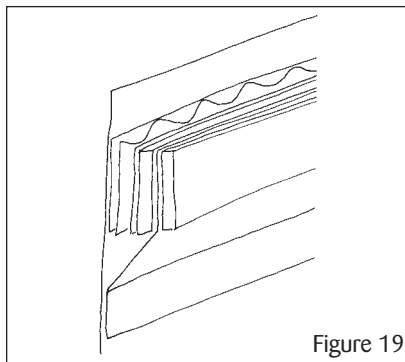


Figure 19

conservation-quality paper is glued to the inside and then pulled down onto the sanded polyester and glued there too. The paper should have a slight bevel to it that will lessen the pressure of the spacer on the surface of the art (see Figure 19). Another

strip of four-ply conservation-quality board is glued to the paper to complete the spacer.

The sanded polyester should extend in front of the spacer and around the glazing so that the spacer cannot come loose in the frame. The spacer can be secured to the acrylic glazing with double-sided acrylic tape and once the art, the back mat, and the backing board have been inserted, any paper and polyester that may extend beyond

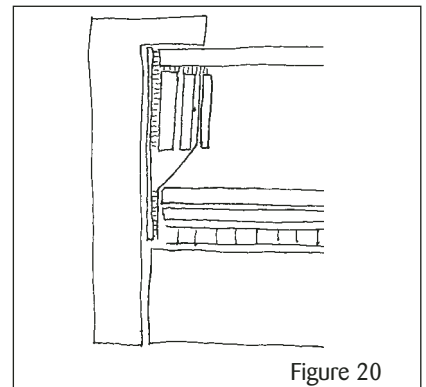


Figure 20

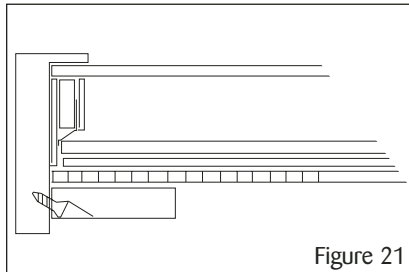
the back of the backing board can be trimmed (see Figure 20). The polyester should give the art some protection from the wood, but if a complete seal is to be created, a tape or laminate that includes a metal foil should be used on the frame.

Positioning Art Near the Spacer

There may be times when a client wants an item framed so that its edges extend under the spacer. This can only be done safely if the portion of the framed item that extends under the spacer is not actually touched by the spacer. One can accomplish this by making the spacer so that its back surface comprises a layer of taut, strong paper, against which the edges of the framed item will rest. Such a spacer has three layers: an outer layer of matboard, a central layer of acid-free corrugated board which is

shorter than the outer layer, and an inner layer of matboard that is the same height as the central layer.

First, the outer and center layer are glued together so that their edges align at the edge that will abut the glazing. A strong, soft paper, such as Japanese tissue, is glued to the outer side of the outer layer and the inner surface of the central layer,



with a gentle tension being applied so that the paper forms a bevel. Once these pieces have been completed, their ends can be cut with beveled cuts at points that

make these pieces equal in length to the inner dimensions of the frame. These pieces can now be glued to the sides of the frame.

The inner pieces can now be cut and glued to the inside of the spacers (see Figure 21). Adding the inner pieces after the other parts of the spacer are in place means that the corners on the inner pieces can be snugly fitted in a pinwheel joint pattern.

This last spacer can only be used with frames that either have or can be rabbeted out to create a wider than normal lip or rabbet width. To give the framer an ample space in which the edges of the item will be fitted, it is helpful that more than one layer of the corrugated board be used. Doing this creates a spacer that is $\frac{3}{8}$ " wide and to accommodate such a spacer, the lip of the frame must be wider than that. The outer layer of board, which holds up

the paper layer, must also be factored into the measurement of the frame. Since this board will be present on all the inner sides of the frame, it will decrease the rabbet opening by $\frac{1}{8}$ " and thus, when the frame is ordered, it must be ordered with both the usual $\frac{1}{8}$ " margin and an extra $\frac{1}{8}$ " margin for the board. Such a frame would then have a margin that is $\frac{1}{4}$ " and a lip that is roughly $\frac{1}{2}$ " wide. This is certainly not an ordinary frame, but this spacer design is also only needed for extraordinary cases.

Cushioned Spacers

Certain artworks, such as oil paintings on paper, may be difficult or impossible to hinge, and may, in fact, have been framed in the past as if they were on canvas, with the frame coming over the edge of the painting. These artworks are often best handled with the appropriate spacer.

In most cases, the spacer cannot be placed on the surface of the art because it would unduly abrade and constrain the work. Stretched paper spacers can be used with art on board, but these designs will not work with art that is not on a board and, thus, is not rigid. If a spacer is to set on the edge of the art, it must give very gentle support and allow for some dimensional change in response to changes in relative humidity. A properly padded spacer can provide broad support with minimal adverse constraints.

Spun polyester padding can be used to create such a spacer; it is chemically inert, will not press aggressively on the surface of the art, and it will not condense in moist conditions. It has been used frequently in textile conservation. Strips of conservation-quality board and strings of Japanese tissue to

cover the padding and an archival adhesive are also needed. The polyester padding should be $\frac{1}{8}$ " thick to facilitate construction, since a thicker type would be difficult to handle. The height of the spacer will result from the thickness of the covering paper and should be roughly $\frac{1}{4}$ " thick.

To accommodate this kind of edge support, the frame must be made so that its lip will cover the edges of the art by at least $\frac{1}{4}$ " on all sides, and so that the art will not come within $\frac{1}{16}$ " of the rabbet. Since the art will be so near to the rabbet, it is wise to line the rabbet of the frame with a vapor barrier. If the frame has a lip that is $\frac{1}{4}$ " wide, a spacer which is $\frac{3}{16}$ " wide can be made to be used under it.

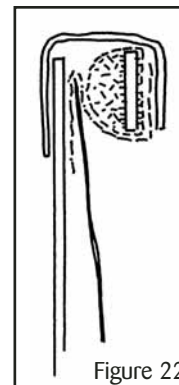
This can be started by gluing the polyester padding to a sheet of conservation-quality board. When this is dry, it can be cut into strips; these strips can then be covered with Japanese tissue. Strips of tissue which are wide enough to wrap around the padding and board should be adhered to the board along one edge of the tissue, and when that has dried, the tissue can be pulled around the padding and adhered to the other edge of the board.

An additional strip of Japanese tissue of the same width should be glued along one of its edges to the back of the board where the first strip has been attached. This strip will be folded back on itself so that it can form a trough which will prevent the art from slipping down or sideways and coming into contact with the frame. These strips should be allowed to dry so that any residual vapors from the adhesive will dissipate.

A back mat of four-ply conservation-quality board should be cut so that it is slightly larger than the

work of art. The spacers can then be mitered so that they fit the dimensions of the back mat and taped to it along each edge with linen tape. The tape should be adhered to the board side of the spacer, and should extend around its outside edge and be attached to the back of the back mat. This will allow the spacer to fold into place around the edges of the art.

The second strip of Japanese tissue should be folded so that it covers the inside edge of the spacer and doubles back under the edges



of the art. After the spacers have been dried and folded out, the art can be placed on the back mat and the spacers folded over its edges. Strips of linen tape can be placed over the miters at the corners and run around to the back of the corners of the back mat to close the housing and secure the art (see Figure 22).

Conclusion

The physical aspects of conservation framing present a challenge to the inventiveness and structural creativity of the frame. The materials used to house the art should be inert and the designs used should provide gentle support that does not confine or abrade. The designs described here employ paper elements that will expand in rising humidity to provide slack for the expansion of the art and will react conversely in drier conditions. As more is understood about how paper and other delicate materials fare in frames more sympathetic structures will be developed that will begin to approximate the success of the great survivals from history.