One Hundred Anatolian Flatweaves: Conservation For Exhibition, Travel, and Storage

by Sarah Gates

Flatweaves from the Caroline and H. McCoy Jones Rug Collection will go on exhibition for the first time in November 1990 at the Fine Arts Museums of San Francisco. Their conservation has been the primary focus of The Museums' textile conservation staff for over three years.

The focus of this article is the mounting system developed specifically to resolve the problems entailed with this exhibition, its travel to exhibition venues abroad, and its final storage in the existing rolled storage system at the Museums. Many textile professionals have been involved with the system's development, beginning with Nancy Sloper-Howard, Conservator, Winters, California; Davina Waterhouse and her staff at Anivad Textile Arts, London, England; and finally, the textile conservation staff and volunteers at The Museums.

The flatweaves from the Carolyn and H. McCoy Jones Rug Collection selected for a November 1990 display at the Fine Arts Museums of San Francisco have been estimated to be pre-19th century.[1] They range in warp length from 12 inches (30.5 cm) to 15 feet (457.5 cm), with an average overall size of 5 feet by 7 feet (152.5 cm x 213.5 cm). Some are woven in two separate sections and joined along the selvedge; some are whole; and others arrived in as many as five pieces. Several are unquestionably fragments and others are complete textiles; however, most fall somewhere in between. All, however, are fairly fragile, for while the fibers themselves are strong and flexible, each flatweave suffers from multiple holes, weak and worn areas, broken warps, missing weft, and fraying edges. All were soiled and many have permanent stains.[2]

Analysis

The flatweaves are tapestry woven, that is, they are a weft-faced plain weave with discontinuous weft. Many contain secondary structures. For example, some employ a type of weft float brocading and two types of weft wrapping techniques — plain weave wrapping and singular cut pile weft wrapping. The cut pile wrappings are quite worn and one example contains the remnants of metal thread.[3] The primary fiber is single- or double-strand wool, although undyed cotton was used occasionally as weft.[4]

Although the dyes have yet to be analyzed, they are assumed to be natural in origin since few problems were encountered during aqueous cleaning treatments.

Objectives and Parameters

Developing a system for the conservation of the flatweaves was complex and time-consuming for a number of reasons. A systematic approach is required, albeit a flexible one, to accomplish the treatment of a large number of similar textiles. Added to the problems imposed by the great number of flatweaves were their large size, fragility, the need to fit in the existing rolled storage system, and the difficulties entailed in sending a textile exhibition abroad. Further, there was no written information pertaining to the conservation of flatweaves, no other individuals seemed to have attempted anything similar, and the success of any new system requires time for testing. Many questions had to be posed, among them:

- What will the flatweaves do after they have been rolled in storage for months?
- What is the simplest, safest, and most cost-effective method to ship, install, and deinstall them at foreign venues?
- How will they behave after they are exhibited for three- to six-month intervals over a

two year period?

- What is the safest and most cost-effective way to protect their intrinsic textile characteristics of flexibility?

The objective was to make a number of large-sized, fairly fragile textiles as stable as possible while on exhibition, during travel, and while in storage. The development of the system was governed by three parameters: curatorial aesthetic, conservation ethics, and the constraints of time and budget.

"Curatorial aesthetic" refers to the choices made by the curator as to the desired final appearance of each flatweave. For instance, it was decided not to use dyed fabric patches to lessen the visual disturbance caused by holes and weak areas and to remove all previous repairs.[5] Also because of aesthetics (and space limitations), it was not possible to display the pieces flat on floor platforms, which would have reduced conservation time considerably.

The term "conservation ethic" is used to refer to the conservator's desire not to add or alter anything of the original flatweave, and thereby maintain its historic integrity for the benefit of future scholars, and to use treatments which are reversible. This eliminated for consideration techniques such as reweaving missing areas and painting bare warps to simulate missing weft.

Time and budget constraints required the use of available materials. Limited funds meant no possibility of highly engineered mounts, and time was limited in that the conservation work had to fit in a hectic museum and loan exhibition schedule. The work was to be done by a limited number of trained conservators assisted by a large number of dedicated volunteers.

Proposals and Experiments

Many ideas were proposed and investigated during this project. However, because of budget constraints and the need to ship and store the flatweaves on tubes, it was decided from the beginning to stitch-mount the majority of the collection to some kind of flexible support. This would allow for ease of rolling and preservation of their intrinsically flexible nature. To provide for security, the smallest textiles would be exhibited on rigid mounts. For extra support, the most fragile would be placed on modular, fabric-covered slant boards.[6]

All major fibers and fabric types were considered for the mounting fabric. Wool was quickly eliminated due to its elasticity and attractiveness as a food source for pests. Synthetics were eliminated due to their non-hygroscopic nature—their inability to change dimension as the flatweaves would in changing levels of relative humidity. What was required was a natural (hygroscopic) and aesthetically appropriate fabric that was quite flexible but strong enough to accomplish its supporting role.

The color of the mounting fabric was also considered carefully. Since dyeing large quantities of fabric was not economically possible, the fabric needed to be purchased in a color that would enhance all the flatweaves to the greatest extent possible and that would not be subject to fading or extreme color change over time. This eliminated all but neutral, undyed fabrics.

Weave structure was another consideration. For reasons of strength and aesthetics, a plain weave was chosen. Rep weaves were appraised briefly; however, they were not considered strong or flexible enough to fulfill the supporting fabric criteria. Also, the flatweaves vary in weave count, and a single rep weave fabric would not match every flatweave structure.

Although a cotton fabric may have been preferable from the standpoint of being less easily wrinkled and less hygroscopic than linen, an appropriate color and weight was not found. The choice of linen has caused controversy since some conservators feel that the lignin content in linen makes it undesirably acidic, and that modern chemical retting processes used in manufacturing linen fiber weaken it and make it an inappropriate choice as a conservation support fabric.[7] However, in the end, an undyed plain-weave linen was chosen. It was aesthetically pleasing with the overall flatweave collection, and it was hygroscopic, strong, and available in large consistent quantities from a reputable manufacturer at an affordable price.[8]

It was hoped originally that the flatweaves could be successfully attached to the linen using a minimal amount of running stitches and placing them around all large holes and along edges. This technique was tried on a few flatweaves. Weak areas, smaller holes, and bare warps were ignored, and

broken warps were tacked down with only a very few stitches.

It was decided initially to turn the linen back flush to the edge of the flatweave, attach cotton tape and 2-inch Velcro strips to the upper back edge for display, and use 3-inch-diameter acid-free tubes for transport and storage.

The first flatweaves to be mounted were hung briefly, rolled for three to twelve months, and then unrolled and hung again for assessment. It was quickly apparent that this mounting system would not work. The linen was far too tight, appearing to have been stretched across the back of the flatweaves, and it caused them to bubble and pucker. This occurred because the full weight of the flatweave was supported by the linen, which naturally stretched when the two were hung. The weight of the flatweave also pulled the stitches attaching the cotton tape and Velcro, creating indentations and vertical undulations across the top edge. Finally, the uneven, borderless edges were aesthetically displeasing.

These initial failures made it necessary to review the original treatment proposal and undertake further experiments. Rigid support boards, slant boards, and pressure mounts were still economically and practically infeasible. Floor platforms were still undesirable. The possibility of stretching the minimally-stitched flatweaves around collapsible strainers was briefly considered. However, this was rejected due to the cost of constructing the mounts, installation and de-installation time, the overhandling involved, and the stress and strain to the flatweaves when the support fabric and stitches were pulled around the strainers.

Stiffer and heavier plain-weave fabrics were experimented with briefly. However, the flatweaves continued to sag and pucker when hung. Heavier fabric also increased the weight and rigidity of the total assembly, making it extremely difficult to roll the pieces without causing stress and strain.[9]

Experiments using Velcro strips were also performed. Multiple strips were placed vertically and horizontally, as required, on the reverse of the mounted flatweave. Three approaches were tried: with matching strips on the wall; with matching strips on a rigid, fabric-covered mount board; and with Velcro yardage covering the wall. All of these ideas were eliminated as causing distortion. The three techniques were also found to require constant readjustment with continued sagging and puckering over time. The readjustments also caused the support fabric and stitches to stretch, placing further stress and strain on the flatweaves.

Treatment

After considerable analysis and experimentation, a four-step system for hanging the flatweaves was devised. The treatment can no longer be called "minimal," but it does take advantage of labor, which is abundant, rather than funds. For a flatweave from this collection in average condition and of average size (5 ft x 7 ft, or 152.5 cm x 213.5 cm), the mounting can take up to 120 hours of staff and volunteer time.

Preparation of Mounting Fabric

Many steps were taken to clean, remove sizing, and shrink the linen before mounting.[10] The fabric was washed and rinsed three times in de-ionized water in a home-style washing machine, using a pure, synthetic detergent without optical brightener.[11] The fabric was then partially dried in a home-style tumble dryer on high heat for 20 minutes. Still damp, the linen was laid flat on tables on top of cotton toweling. The warp and weft were gently aligned, selvedges were cut approximately 1/2-inch every 6 inches, and the linen was left to dry overnight.

Layout and Addition of Linen "Bag"

The secret of making the flatweaves hang smoothly appeared to be in finding a method of attaching the linen to the flatweave so that there was a small amount of excess fabric, or "bag," as it came to be called, in the linen. It was believed that this would compensate for the differential stretching between the linen and the wool when the two were rolled and then hung. The linen would carry the overall stress and strain of the weight of the flatweave, stretching smooth as in the initial experiments, but because there was excess backing fabric, the flatweave would stay flat and smooth.[12] The second — and far easier — thing done to help alleviate some of the stress and strain was to use a larger-diameter rolling tube (4-1/2-in) for storage and travel.

In addition to following the general

theory of attaching loose linings to support textile materials, the theory discussed above is parallel to the practice of using loose-weave linen "scrim" as a support fabric for large European tapestries. The difference is that rather than working with straight needles on large tapestry frames with the tapestries[13] under tension, the flatweaves are mounted using curved needles as they lie flat on worktables under no tension.[14]

Seaming

After being washed and dried, the linen is cut and pieced to the appropriate size with the warps always positioned so that they will hang vertically.[15] This orientation is chosen because the warp of a fabric is usually stronger than the weft (although in a plain-weave fabric this is difficult to ascertain without professional testing). Seaming is done very carefully by machine, moving the machine alongside the worktable on a small wheeled table, rather than pulling the linen through the machine. This avoids overhandling — and thereby wrinkling — the linen, as ironing is to be avoided because it causes nonuniform tension in the fabric.[16] Rolling tubes are used to move and turn the linen. Seam allowances are a minimum of 3 inches, as the selvedge area is always slightly distorted. Seams are pressed open by hand.

Layout

The linen is then laid out squarely on the worktables, seams down, and the flatweave rolled out on top. The flatweave is centered on the linen, and the warp and weft of the flatweave and linen are aligned as much as possible. Due to distortions throughout the flatweaves, this is never completely successful. At this point, the curator and conservator consult regarding the positioning and alignment of the flatweave's design. Due to their flexible nature and condition, some of the flatweaves are quite malleable and it is easy for the design to be skewed.

Pinning

The flatweave, in its final position, is pinned to the linen. The pins are inserted in alternating rows at intervals of about 6 inches, with care being taken not to pierce warp or weft. The two layers of flatweave and linen are then rolled, turned around, and unrolled with the flatweave face down. Then the two layers are pinned again, one pin next to every pin showing through from the front. Again, the two layers are rolled, but this time very loosely to avoid creasing the linen, and slowly, so that the pins on the face of the flatweave can be removed as the roll is turned. The two layers are immediately unrolled again, with the flatweave remaining face down.

Marking Grain

In order to monitor the straightness of the grain in the linen during the bagging process, lines of large running stitches ("grain lines") are stitched horizontally across the width of the linen, every 12 inches along the length. The grain line stitching does not penetrate the flatweave.

Introducing Bag

For every 12 inches of flatweave, slightly less than 1/4-inch of extra linen is added; e.g., for a flatweave 8 feet long, approximately 2 inches of extra linen are needed.[17]

The bag is added with great care. The amount to be added is measured in at one end of the linen by stretching a string across the top of the linen next to the first grain line, and securing it to the worktable with adhesive tape. The width of the space between the string and the grain line equals the total amount of bag to be added to the flatweave (2 inches for the example above). Glass weights are used to push up and secure the extra linen, which forms a bubble across its width (fig. 1). The first 12 inches of pins are then removed from that end of the linen and the bubble, or bag, is moved up and over onto the back of the flatweave by fingertip manipulation (fig. 2).

The addition of the extra linen moves the first grain line so that it can be aligned with the string. By moving the weights, small adjustments are made in the size of the bag until the string and the first grain line are precisely parallel. The linen and flatweave are then pinned together along the first grain line and the string is removed (fig. 3).

This process is repeated, unpinning approximately one foot of linen at a time, advancing the bag while leaving extra fabric behind in small bubbles held in position by rows of pins. All movements are made with great regularity, and the grain lines are continuously checked for straightness, as this is

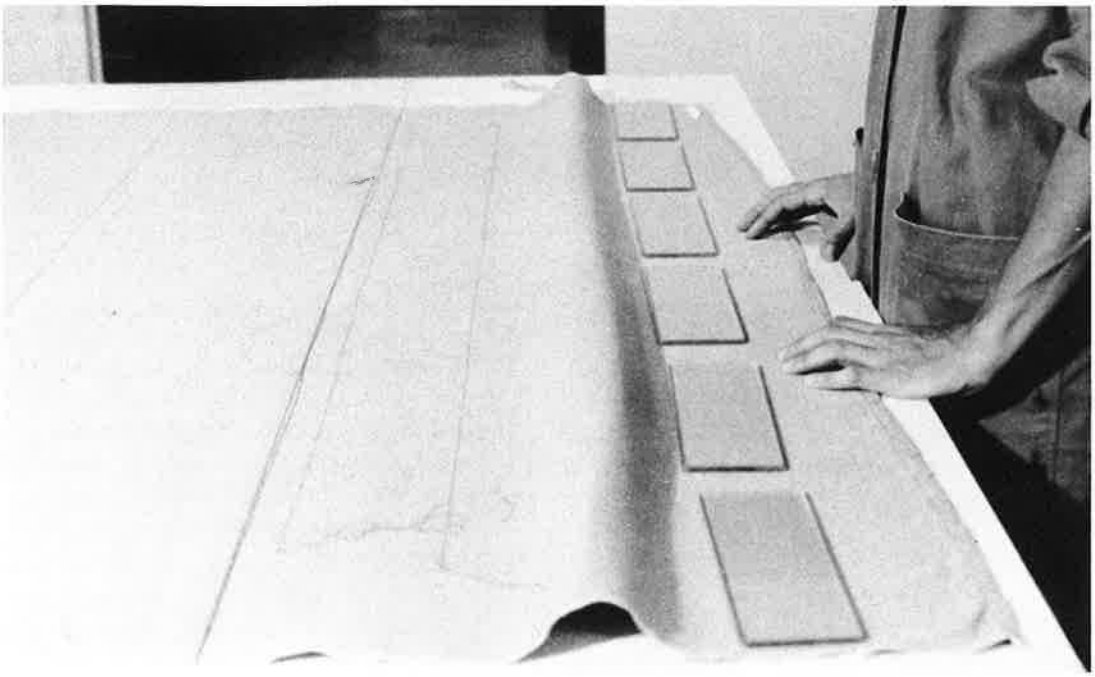

Fig. 1. Glass weights are used to secure the extra linen which forms a bubble across its width.

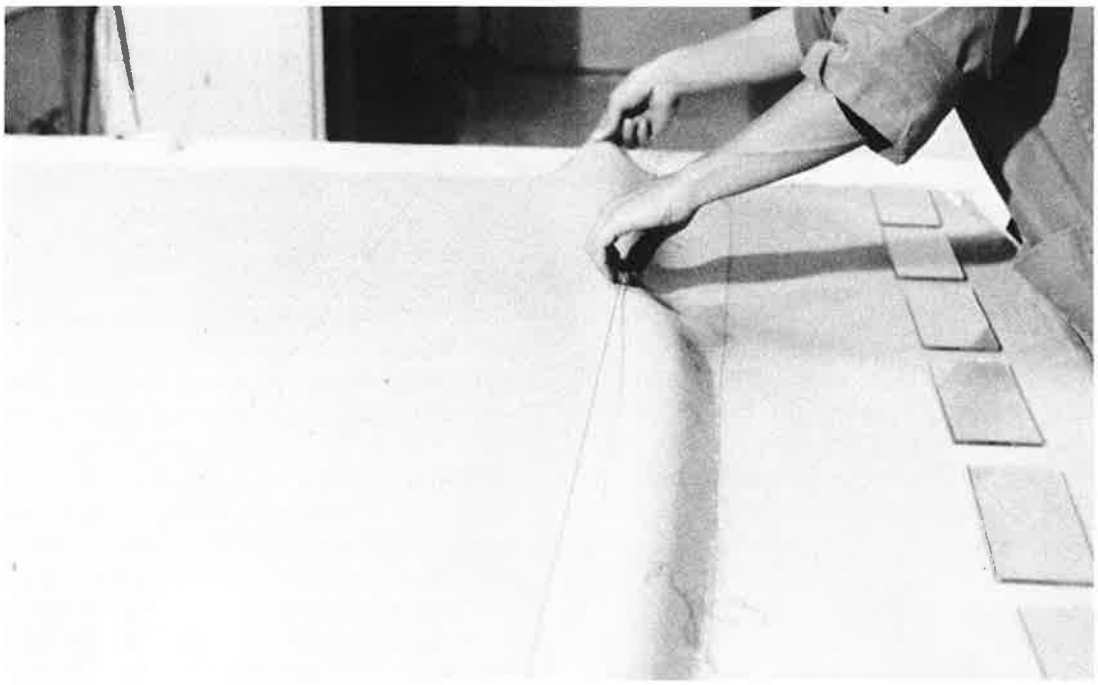

Fig. 2. The "bag" is moved up and over onto the back of the flatweave by fingertip manipulation.

the only way to introduce the bag evenly (fig. 4). Great care is also taken to advance the bag without shifting the flatweave underneath. After the bag is pinned down the length of the flatweave, adjustments are made so that the bag is evenly placed overall.[18]

After pinning in the bag, the flatweave and linen are loosely rolled and turned face up. Adjustments are then made in the pinning so that the linen does not protrude through holes in the flatweave and all areas lie reasonably flat, with warp and weft as perpendicular as possible. This is the last opportunity to check the alignment of the flatweave design. Repositioning and repinning is often unnecessary, but when needed it has to be done carefully to maintain the bag in the linen underneath.

Fig. 3. The linen and flatweave are then pinned together along the first grain line and the string is removed.

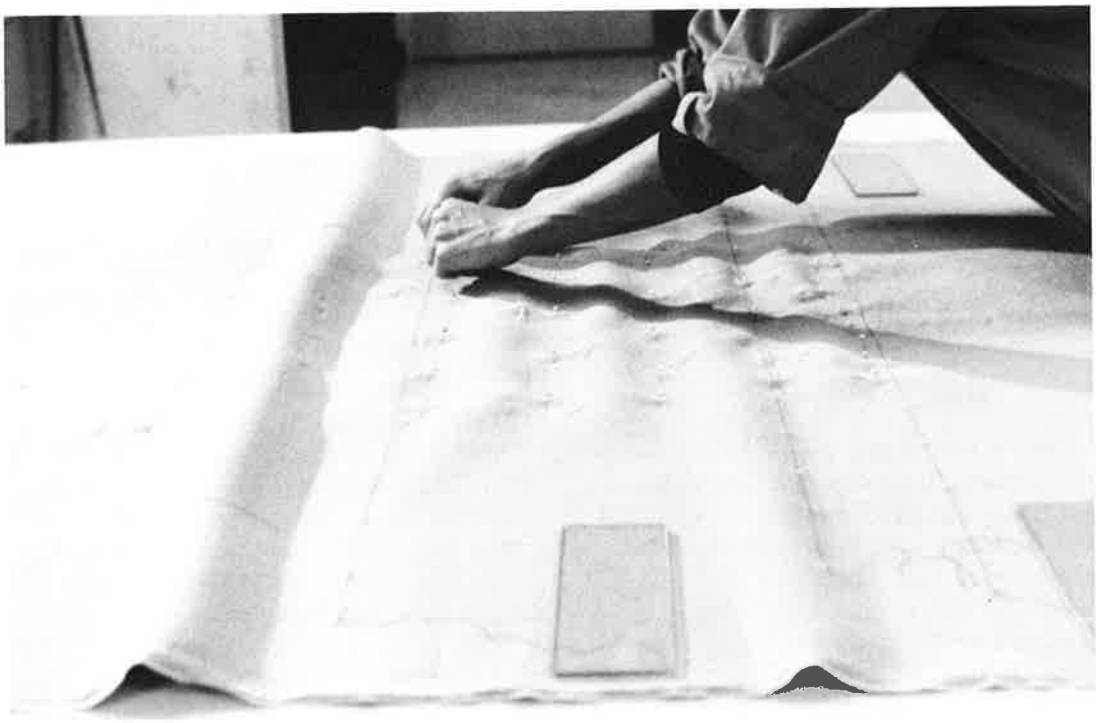

Fig. 4. The grain lines are continuously checked for straightness, as this is the only way to introduce the bag evenly.

Verticals

The idea for the use of lines of vertical support stitches was taken from research conducted by Margaret Ordoñez.[19] The "verticals" consist of large running stitches sewn in the direction in which the flatweave will be hung. They are placed in rows of parallel lines, 5 to 8 inches apart and between 8 and 12 inches long (depending on the condition, design, and weight of the flatweave). In each row, the verticals are offset from those in the rows above and below, so that alternate rows align. When viewed from the back, the verticals form an overall brick-like pattern (fig. 5).[20]

To make it simpler to stitch the verticals,

a grid is laid out on top of the flatweave with string. Depending on what row is being worked, the vertical line either follows a string or is centered in a space between two strings. Every time a row of verticals is finished, the flatweave is rolled slightly on its tube, pulled back to the edge of the table, and another row is begun. Verticals at the top and bottom are doubled up as these areas will be subjected to more stress: the top supports the weight of the whole flatweave and the bottom is the first edge to be rolled around the storage tube.[21]

One-sixth of a strand of cotton embroidery floss is used for the stitching because of the wide range of colors available, its soft spin and ability to hide between the wool weft, and its long-term successful use in the conservation of European tapestries. The stitches are fairly large, about one inch on the back and catching one warp yarn on the front of the flatweave. Two large stitches are taken in the reverse direction at the beginning and end of each line. Back stitches and knots are avoided, since it is preferable that the linen be allowed to slip rather than the flatweave be bound.

Horizontals and Securing Broken Yarns

The term "horizontal" refers to a line of running stitches used to provide support for a holes or weak areas. These lines are always placed parallel to the weft. If the flatweave is to be exhibited on its side, hanging from its weft, then these "horizontals" are in fact going in the same direction as the verticals.

The horizontals extend beyond all holes by at least 3 inches and, when used to support weak areas, can cover the entire width of the flatweave. The horizontals are staggered in length so as not to create an area which could bind the flatweave, causing it to bubble when hung. The stitches resemble those used for the verticals, going over one warp yarn on the front of the flatweave and approximately an inch on the back. The stitching is always done with a grid in mind, since that is the basis of the tapestry weave structure (fig. 6). Angled stitches are avoided as they will cause stress, strain, and distortion to the flatweave fibers and weave structure when hung.

While the horizontals are being stitched, broken warp and weft yarns are secured with a separate thread, since these stitches are not meant to support any weight. Angled stitches are used to secure bare or broken warp and to blend with the spin of the warp yarns. They are put in sparingly, approximately every inch in alternating rows. Loose and fluffy weft over 1/2-inch long is secured with laid and couched stitches.

The edges and warp ends of the flatweave are the final areas to be secured. Here stitches are placed along the edges in short alternating rows to ensure that the flatweave does not cup away from the linen.

Afterwards, the flatweave is hung for assessment. Rarely is it necessary to remove or redo any of the stitching. Each flatweave hangs from three to seven days, although the first pieces completed were hung for a mini-

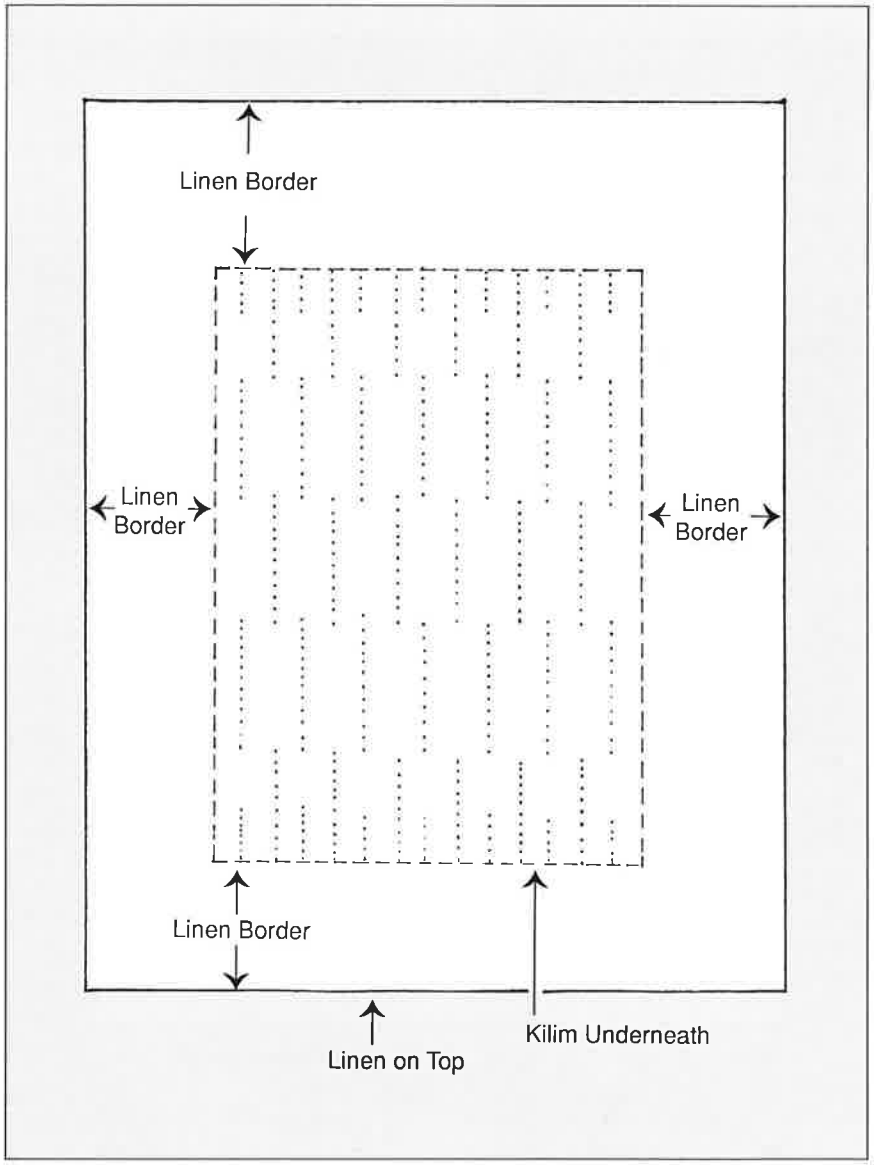

Fig. 5. Vertical support lines: reverse.

mum of three months to test the stitching technique.

Finishing and Rolling

The final stage of the treatment consists of deciding on border proportions, attaching the cotton tape and Velcro (retained from the original experiments as the most practical, cost-effective, and safe method of hanging), and making the final "shroud," or cover, for the flatweave when it is in storage or traveling.

Choosing border proportions is similar to deciding mat and frame proportions for a work of art on paper. The width of the border selected for each flatweave varies according to its design, size, and wholeness.

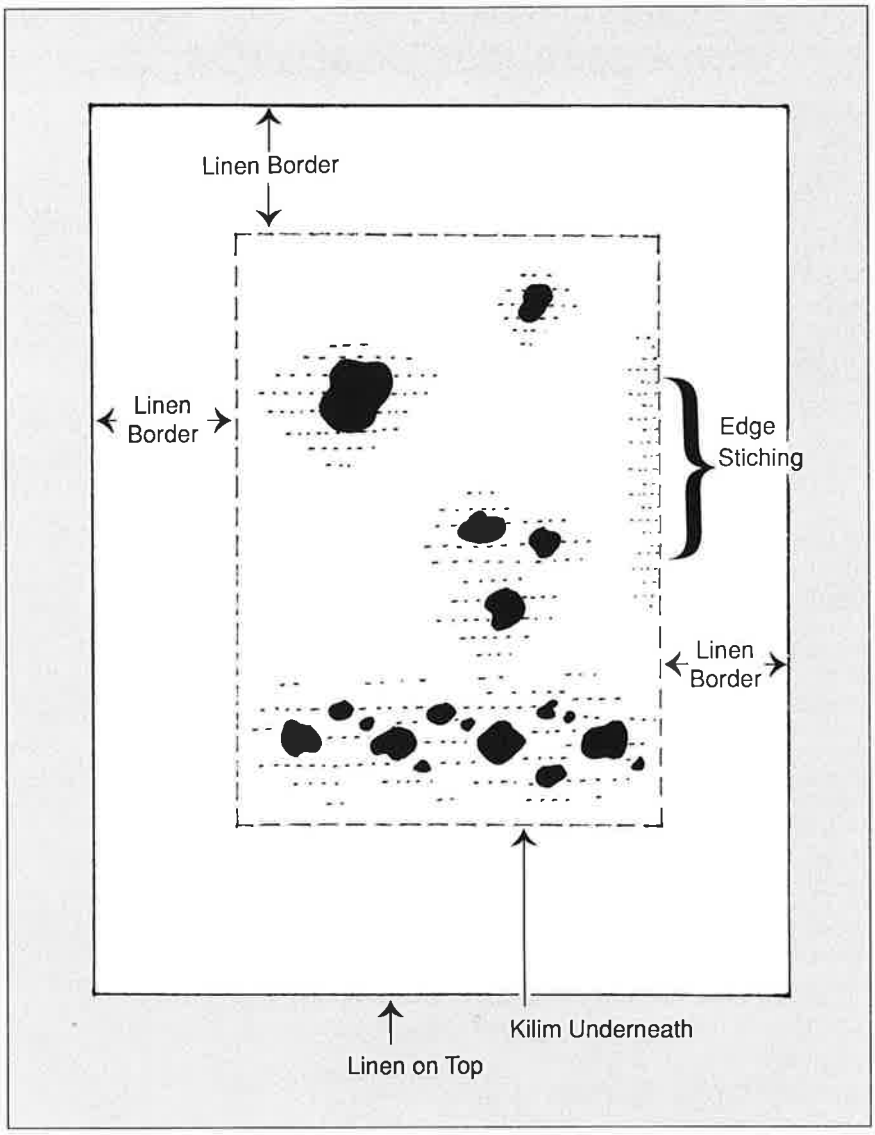

Fig. 6. Horizontal support lines: reverse.

Varying border widths are experimented with by hanging black cloth tape along each side of the flatweave. The tape serves two purposes in that it establishes a plumb line and provides a visual barrier that helps in judging the borders. After the borders are agreed upon — usually 3 to 5 inches — the tape is pinned in place. At that point, the mounted flatweave is laid out flat on the worktables and squared up.

One of the many secrets discovered to achieving an aesthetically pleasing, smoothly hanging, and more easily rolled mount is the insertion of strips of linen interfacing inside the side and bottom hems. These are carefully cut to conform to the uneven edges of each flatweave and stitched loosely in place to the border hem. The hems are always kept wide enough to overlap the edge of the flatweave on the back so the hemming cannot be seen, and they are secured with herringbone stitches.

The top border is approximately 4 inches wider than the others to accommodate the hanging system. Two-inch-wide Velcro is machine-sewn with polyester thread, to washed, 3-inch-wide cotton plain-weave tape. The tape and Velcro are then positioned across the back top edge of the linen and pinned in place. The tape is hand-sewn to the linen, using polyester-cotton carpet thread in a zig-zag-like pattern of stitches about 1/2-inch long.

Each flatweave is stored rolled in the direction of the warp on a 4-1/2-inch-diameter acid-free rolling tube that is 12 inches longer than the width of the mounted flatweave. This extra tube length facilitates safe handling and allows an area where the fabric dust cover can be tied closed without cinching the flatweave.

Each cover is constructed from washed cotton twill fabric the width of the tube and long enough to wrap at least one and one-half times around the rolled flatweave. Lengths of 1/2-inch washed cotton tape are sewn to each cover every 12 inches along one long edge so that it can be tied in place around the flatweave. The Museums' identification number is written on the outside edge of the cover. When unrolled, the cover can double as a drop cloth during the installation and de-installation of each exhibition.

Rolling the flatweaves, especially those

that will be hung from the weft and consequently have Velcro running parallel to the warp, takes a keen eye and considerable practice and patience. Because of the different thicknesses of fabric in the whole assembly (Velcro edge, border, flatweave, and linen), they must be carefully padded to create a smooth, even roll in which the textile is not stressed. This is accomplished with scraps of cotton twill fabric, as acid-free paper is not thick enough and polyester batting too thick.

Aluminum Channel Hanging System

Normally, when Velcro is used to hang large textiles, the soft (loop or female) half is sewn to the reverse of the textile and the rough (hook or male) side stapled to a wood slat attached to the wall. Because most of the flatweaves' edges are fragmented, there is no place to hide the stitches attaching the tape and Velcro to the mounted flatweave. Hanging in this fashion caused unsightly stitch

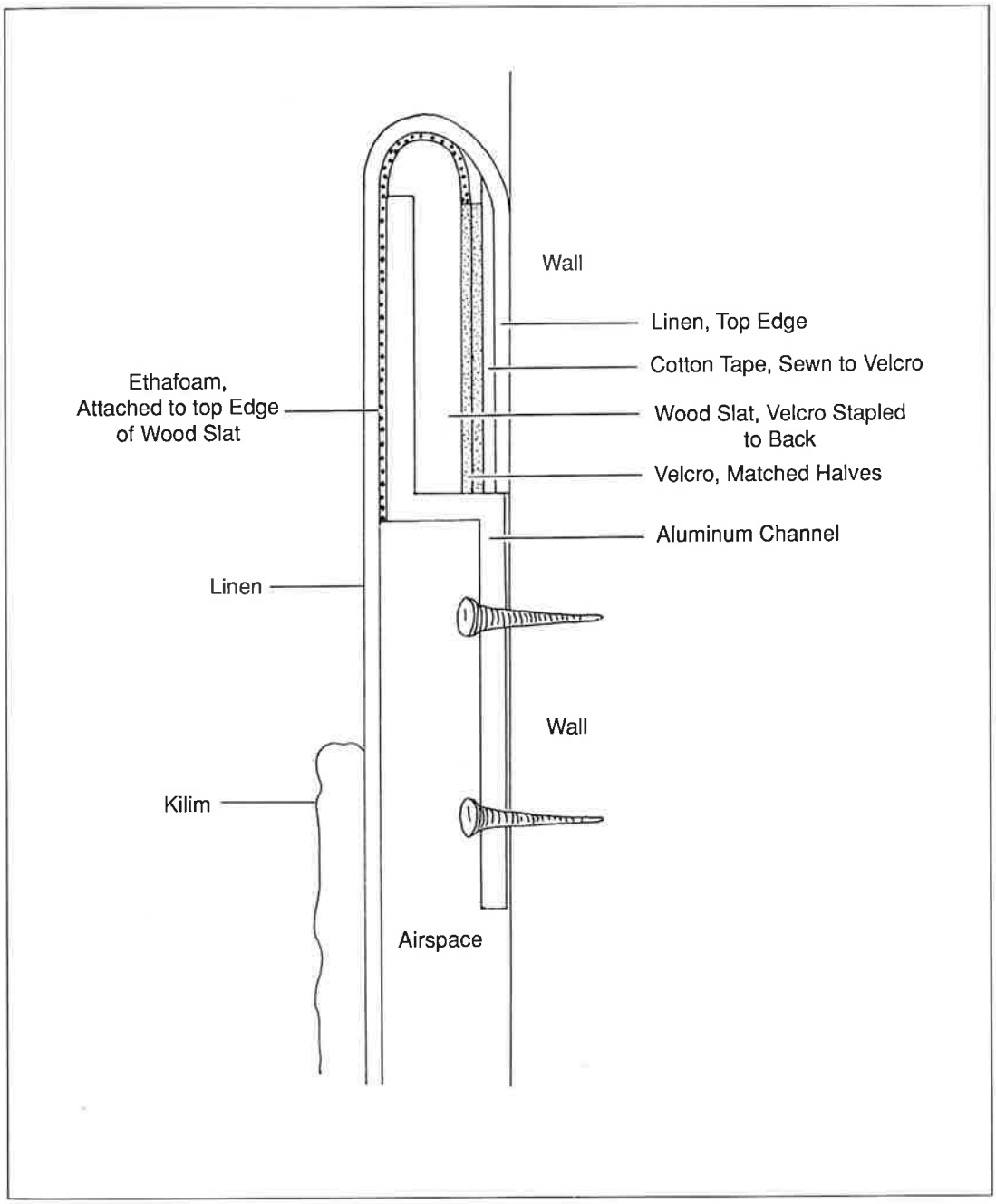

Fig. 7. Aluminum channel hanging system for flexible mounts.

indentations and vertical undulations in the top portion of the mount. Consequently, it was necessary to find an alternative hanging system that would provide continuous, adjustable support for the flexible mounts, and one which was quickly and easily installed and de-installed with minimum handling of the flatweave.

The extra-wide top linen border with cotton tape and Velcro attached is wrapped around to the back of a wood slat where the matching Velcro has been stapled. The top edge of the wood slat is curved and the front side has a shallow notch.[22] A strip of 1/8-inch ethafoam is glued to the curved edge of the wood and left free over the notch.[23]

An "S"-shaped channel is bent from a 5-3/4-inch strip of 1/8-inch-thick aluminum, cut to the width of the mount; this is bolted to the wall forming a sort of "shelf" (fig. 7).[24] Where the channel cannot be bolted directly into the wall it can be attached to wood and the wood hung from the ceiling.[25]

Installation of the flatweave is simple. The slat is attached to the mounted flatweave while it is still rolled on its tube. Using two ladders, the slat and flatweave are carried up to the channel. The wood slat, curved edge up, is slipped into the channel so the aluminum fits into the notch in the slat and is held snugly upright between the aluminum and the wall. The ethafoam slips down as a barrier and pad between the aluminum and the back of the linen, giving a clean professional look to the top edge of the mount.

De-installation proceeds just as easily; the flatweave is rolled on a tube from the bottom edge up, and it and the slat are slipped out of the channel. The mounted flatweave is then re-rolled face out, tied securely with cotton tape, and covered with its cover.

Treatment Conclusion

The final result of this project is a flatweave mounted to a flexible fabric support by means of large, easily removed stitches placed over the whole of the textile. The stitches are placed in series of rows, usually at right angles to one another, using a strong thread of a sympathetic color which will not cut into the fiber of the flatweave. Despite budget, limited time, and a great number of flatweaves to treat, a conservation system has been devised that is safe for display and storage, that fulfills museum conservation standards and curatorial aesthetics, and which retains a high degree of integrity for each flatweave.

Acknowledgements

I would like to thank the textile professionals mentioned throughout the text; the staff and volunteers, past and present, of The Fine Arts Museums of San Francisco; Cathryn Cootner, Curator-in-Charge of The Museums' Textile Department without whose dedication to the Jones Collection this work could not have been undertaken; and finally, Caroline Jones, for her unending generosity to The Museums' permanent collections.

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About the Author

Sarah Gates was awarded a bachelor of arts degree in the Practice of Art, Phi Beta Kappa, by Mills College in 1981. She then went on to complete the Postgraduate Course in Textile Conservation at The Textile Conservation Centre, Hampton Court and the University of London. During that time she was hired as Associate Conservator for the Fine Arts Museums of San Francisco, where she is currently responsible primarily for the conservation of the Caroline and H. McCoy Jones Rug Collection.

Notes

1. The pre-19th century date is a general one given to the whole collection by Cathryn Cootner, Curator-in-Charge of the Textile Department of the Fine Arts Museums of San Francisco. Ms. Cootner will be discussing this in depth in the catalogue accompanying the upcoming exhibition, "The Art of the Anatolian Kilim," in November 1990. However, two flatweaves from the collection, thought to be two of the oldest pieces, were sent to the University of Arizona to be radiocarbon dated by Dr. A. J. T. Jull of the Department of Physics in February 1989. The following are the results:

Museums' I.D. Number	Calibrated Age	% Possibility
L88.12.2A	1414 - 1478 AD	100 %
L88.12.1	1530 - 1548 AD	8 %
	1635 - 1680 AD	32 %
	1734 - 1805 AD	48 %
	1937 - 1955 AD	12 %

2. Stain removal and aqueous cleaning were performed by various textile professionals including Leslie Melville Smith, Head Textile Conservator at The Museums.

3. The flatweave with remnants of metal threads in its cut pile weft wrappings is The Museums' I.D. no. L88.33.2.

4. The second volume of the exhibition catalogue by Cootner will contain all of the technical analysis of the flatweaves: fiber and spin identification, weave count, structural analysis, radiocarbon dating, and dye analysis.

5. The one flatweave to retain its repairs is The Museums' I.D. no. T89.45.1. These were kept at the urging of staff conservators since almost all of the flatweaves had been given to the Fine Arts Museums of San Francisco after their repairs had been removed. For documentation purposes, it was felt important to retain an example of what is believed to be a quite common early repair technique. The repairs are executed with a coarse, now faded, polychrome wool yarn in an interlocking buttonhole stitch. The stitch technique allows the repairs to follow the original design of the flatweave where weft or warp is missing. Consequently, there are wide, zig-zag-like borders of repair work down either edge of the flatweave, as well as circular areas over holes and short stripes along worn edges.

6. The rigid mounts are constructed of a low-resin, well-seasoned, sealed wood frame/strainer covered with a solid panel of double-thick Archivart Multi-Use Board or Tycore Paper Honeycomb Solid Support Panels. The frame and panel are covered with a thin layer of polyester batting and a layer of washed, plain-weave linen. The flatweave, mounted on a separate linen support fabric, is then stitch-mounted to the covered panel with rows of vertical running stitches. After being exhibited, it will be removed from the panel. The flatweave and its support fabric will be rolled face out for storage. For more information on Tycore mounts, see Jeanne Brako, "Textile Mounting and Support Techniques: Stretchers, Strainers and Solid Supports," *Textile Treatments Revisited: Conference Abstracts* (Washington, D.C.: Harpers Ferry Regional Textile Group, 1986), 47-49.

7. Nobuko Kajitani, "Care of Fabrics in Museums," *Preservation of Paper and Textiles of Historic and Artistic Value*, Advances in Chemistry Series 164, John C. Williams, editor (Washington, D.C.: American Chemical Society, 1977), 166.
L. Masschelein-Kleiner and J. de Boeck, "Contribution to the Study of the Conservation of Monumental Tapestries," *Preprints, 7th Triennial Meeting, ICOM Committee for Conservation* (Paris: ICOM in association with J. Paul Getty Trust, 1984), 84.9.34.

8. The plain-weave linen used was purchased from the Ulster Weaving Company of New York: no. 4777.54. Unwashed and unshrunk it was 54 inches wide and cost $6.30 per yard (1990 price).

9. "The supporting fabric should be as flexible as possible for good reasons. Firstly, it might be expected that if two layers of the same fabric are put on top of each other, the stiffness (or more exactly the flexural rigidity) of the resulting "sandwich" will be doubled. However, experiments have shown that the flexural rigidity of the combination becomes more than twice as high. Apparently the friction between the two layers plays a stiffening role. This effect can also be expected when two layers of fabric with different rigidity are put together. Secondly, the stiffness will still more increase when, as is usual in the restoration process, the two layers are in some way fastened to each other, either by sewing or by an adhesive."
A. J. de Graaf, "Tensile Properties and Flexibility of Textiles," *Conservation and Restoration of Textiles* (Milan: C.I.S.S.T., 1980), 61.

10. The guidelines for preparing the mounting fabric are modifications of those currently being researched and drafted for publication by the American Society for Testing and Materials Task Group no. D13.53 on Backing Fabrics in Textile Conservation.

11. "W.O.B. Detergent" (without optical brightener) is available from the American Association of Textile Chemists and Colorists (AATCC), 1 Davis Drive, P.O. Box 12215, Research Triangle Park, N.C., 27709-2215.

12. "For embroidery the frame is nearly always stretched absolutely taut, even when two layers of fabric are involved, which can lead to puckering around the areas of stitching and the creation of pockets of loose fabric when the tension is relaxed. This is most undesirable in conservation. To avoid such a result the upper layer of the two fabrics, i.e.,

the object, is put under greater tension than the lower one, i.e., the support.

Tapestries, large canvas work embroideries and any of the heavier objects which are hung for display, have a tendency to drop under their own weight, causing an increase in dimension of several centimeters. If there is no allowance in the backing to accommodate the increase the result will again be the creation of loose pockets between areas of stitching. There is a school of thought which prefers to counteract the stretch in the object by very thorough stitching to a rigid backing, thus preventing any movement between the two. In this book a different point of view is maintained, preference being given to providing enough slackness in the backing to allow the object to move naturally."
Sheila Landi, *The Textile Conservator's Manual* (London: Butterworths, 1985), 101.

13. Karen Finch and Greta Putnam, *Care and Preservation of Textiles* (London: B.T. Batsford, 1985), 113-21. *The Conservation of Tapestries Research Report*, Greta Putnam, editor (Hampton Court: The Textile Conservation Centre, 1984), 34-51.

14. Tapestry frames were rejected because the support fabric had to be put in uniformly since the amount of fabric would directly influence the appearance of the borders.

The number of holes and incomplete condition of many of the flatweaves also made it desirable to treat them *in toto* rather than section by section. Finally, it was felt that the flatweaves should be put under as little tension as possible during the mounting process.

15. The linen is cut and seamed so that after washing it is 15 inches larger on all sides than the flatweave. This provides extra linen for bag, borders, and border hems.

16. If the linen does become wrinkled during the mounting process, the creases are easily removed by spraying sparingly with deionized water, weighting lightly with glass weights, and leaving it to dry.

17. If more than 1/4-inch of linen per foot is added, the borders pucker and appear to be almost gathered. In addition, it becomes impossible to roll the whole assembly smoothly around its storage tube.

18. An experiment was undertaken to see if the bag could be added more quickly using a sewing machine. Long lines of gathering stitches were sewn into the linen after it had been pieced together. After laying the linen out flat, the gathering threads were pulled slightly. The flatweave was then laid on top, adjusted so that warp, weft, and design elements were aligned, and pinned in place. Unfortunately, this was not successful and resulted in far too much linen being added into the whole assembly.

19. Margaret T. Ordoñez and Alfred A. Ordoñez, "Evaluation of Mounting Techniques Used on Vertically Hung Textiles," *Preprints, 7th Triennial Meeting, ICOM Committee for Conservation* (Paris: ICOM in association with J. Paul Getty Trust, 1984), 38-41.

20. "It is important that this lining supports the weight of the tapestry as evenly as possible. If for instance the lining is fastened to the tapestry with rows of stitching running from top to bottom at regular intervals, the tapestry is not supported in the regions between the stitching, and here sagging again may occur. It might be better to make short stitching more or less distributed at random over the whole area of the tapestry."
de Graaf, "Tensile Properties and Flexibility of Textiles," 59.

21. "Best method of sewing consists in alternate vertical stitches. We apply this method but the stitches are sewed closer to each other on the upper third of the tapestry."
L. Masschelein-Kleiner and J. de Boeck, "Contribution to the Study of the Conservation of Monumental Tapestries," 84.9.36.

22. The technical name for the wood slat is a "window step" and it is widely available. The size used was 4-1/2-in x 11/16-in x the length of the mounted flatweave. The notches were custom cut by The Museums' technicians.

23. The ethafoam attached to the top of the wood slat is 1/8-in thick x 6 in x the width of the mounted flatweave.

24. Extensive research was undertaken to determine the most cost-effective way to manufacture the channel shape. Welding two "L"-shaped channels together and having a custom die cut were both eliminated due to cost. Bending 1/8-inch- thick sheet aluminum was found to be the cheapest method. A strip 5-3/4-inches by the width of the mounted flatweave is bent so the two "legs" are 2-1/2-inches long and the connecting section equals the thickness of the wood slat plus all the layers of Velcro, cotton tape, and linen. This last dimension will vary depending on the materials one chooses to use.

25. If the wall is warped or uneven, the channel can be cut into shorter segments, attached to a wooden batten, and the batten hung from the wall.