

Solvent-Set Book Repair Tissue

ABSTRACT

This paper presents the development of and techniques for repairing leather using a custom-toned, solvent-set repair tissue made with Lascaux Acrylic Adhesive 498HV. The tissue repairs do not darken deteriorated leather and are more readily reversible than repairs made with other adhesives. Although designed for board reattachment and quick, simple repairs to leather bookbindings, the material and techniques may be applied successfully to complex treatments.

INTRODUCTION

Solvent-set book repair tissue is an experimental material developed at the Harvard University Library. This repair tissue was designed for batch treatments of leather-bound, special collection materials and is a variation of other book repair techniques using Japanese paper (Etherington 1995). The technique uses Japanese paper that is toned with acrylic paints and then coated with Lascaux 498HV acrylic adhesive. The dried adhesive-coated tissue is reactivated for use with low-toxicity non-aqueous solvents such as ethanol and isopropanol. Open time for the remoistened adhesive is sufficient for careful manipulation and placement of the repair, but the rapid evaporation of the solvent sets the repair in under five minutes.

Traditional leather repair uses thin, new leather inserted under the old; lifting the old leather can be a difficult process, and the new leather often fails even more quickly than the original. Newer approaches using Japanese paper applied to the surface of the damaged leather were developed as an alternative to traditional techniques. Current paper-based leather repair techniques use a vari-

ety of adhesives including wheat or rice starch paste, polyvinyl acetate (PVA), and methyl cellulose, alone or in mixtures. Repairs using paste require long drying times, risk permanent darkening and hardening of the leather, and are difficult to reverse without placing the leather at further risk from moisture. Repairs adhered with PVA reduce the risk of darkening leather and dry quickly, but cannot be reversed without damaging the leather surface.

The advantages of solvent-set book repair tissue include: quick application and setting time; strength and stability of the repair materials; ease in matching the repair tissue to the binding leather; and reversibility of the adhesive. A solvent-based adhesive is also less likely to darken or more seriously damage aged leather, as is common with water-based adhesives. The solvent-set tissue can be applied successfully to board reattachments, spine and cap repairs, and joint damage.

ADHESIVE

Lascaux 498HV adhesive has been primarily used in paintings and textile conservation. Unlike Lascaux 360HV, Lascaux 498HV is not tacky at room temperature. The manufacturer describes it as a “dispersion of a thermoplastic acrylic polymer on the basis of methyl methacrylate and butyl acrylate” which is “thickened with acrylic butylester,” and claims that it is “permanently soluble in acetone, toluene, Thinner X, etc.” (Diethelm 2003) We have found that the dried film may be softened and made tacky with either heat or solvent, including isopropanol and ethanol.

Accelerated aging and testing of Lascaux 498HV was conducted by Michael Duffy (Duffy 1989). The results revealed that the adhesive yellowed somewhat under thermal/light aging of 100+ hours. However, film protected from light during aging remained clear. Lascaux 498HV retained 2.6% swelling in isopropanol (down from 4.8%), and increased to 45.6% swelling in toluene (up from 43.8%). The ability to retain swelling during accelerated

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Fig. 1. Squeegeeing through silkscreen onto polyester film

aging suggests that the adhesive is potentially reversible over time.

PREPARATION OF THE REPAIR TISSUE

The tissue selected for this technique should be a strong, long-fibered, 100% *kozo* paper. It should be reasonably translucent so the color of the volume's leather will show through the finished repair. A paper that has proven successful is KTLG from the University of Iowa's Center for the Book Paper Facility, a smooth-finished *kozo* tissue about 0.05 mm in thickness. Commercially colored tissues are available but should be carefully reviewed for quality of fiber content, color fastness, and light stability.

First, the selected tissue is toned lightly with thinned acrylic paints resulting in a highly translucent material. It is only necessary to match the general color family of the leathers, not to exactly replicate the hue and saturation. This technique requires the color to be much paler than is used for other, more familiar techniques. Working with earth pigments, including raw and burnt umber and raw and burnt sienna, it is possible to prepare a variety of pre-toned tissues suitable for most common leathers. Brighter colors, such as blues and reds, are also easily accommodated. Liquid acrylics such as Golden Fluid Acrylics work well



Fig. 2. Dropping wet tissue onto wet adhesive

for such dilute colors since they disperse easily and remain dispersed rather than settling out.

Next, adhesive is applied to the toned tissue with a method similar to producing heat-set tissue:

1. Spread a thin, even layer of undiluted adhesive onto polyester film by squeegeeing through a silk-screen (fig. 1). A thin coat of adhesive is more flexible, conforms more closely to the leather surface, and is less likely to cause weak leather to delaminate than a thicker coating.
2. Lightly mist the surface of the adhesive with deionized water. The misting creates a more consistent layer of adhesive and prepares the surface for applying the tissue.
3. Lightly mist the tissue with deionized water to pre-expand the fibers and reduce the chance of wrinkling.
4. Carefully drop the tissue onto the adhesive, avoiding wrinkles and bubbles (fig. 2). Surface tension between the two wet surfaces encourages full contact; pressing is not necessary.
5. Allow the tissue and adhesive to dry completely; air dry or use a hair dryer.
6. The dried tissue should be left attached to the polyester for convenient storage, cutting and handling; it tends to curl if removed overall from the polyester.

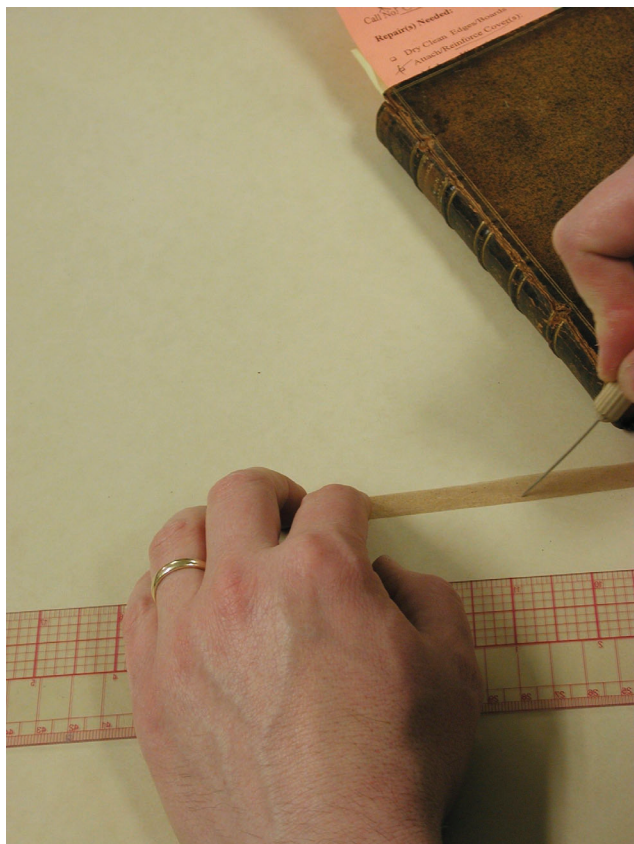


Fig. 3. Customizing a repair strip with a needle



Fig. 4. Trimming to accommodate a label

LEATHER PREPARATION

As with many repairs on leather, a consolidant such as Klucel G is often needed to prepare the surface to accept and hold a repair. We use Klucel G for consolidation of larger areas. However, we find that a solution of Lascaux 498HV dissolved in alcohol consolidates the repair area with only one coat, leaves the leather flexible, and provides a good surface to adhere to the solvent-set tissue. The Lascaux 498HV emulsion is mixed with just enough isopropanol to dissolve the adhesive into a clear, slightly viscous solution (approximately 1:5, Lascaux 498HV: isopropanol).

We have heard of one instance of alcohol-dissolved Lascaux 498HV not penetrating well on a deteriorated modern leather and remaining somewhat tacky on the surface. However, we have not had that experience during two years of using the mix for consolidation. Test carefully before using to be certain.

Although the solvent-set repair technique was developed as a surface repair, it may be used in the more traditional sense by inserting the repair tissue under lifted original leather. This method may be advisable when working with original leathers with a tendency to delaminate, such as sheepskin. Solvent-set repair tissues may also be used to face original leather during the lifting process.

REPAIR TECHNIQUE

The Lascaux 498HV solvent-set repair tissue was developed for reattaching boards or repairing damaged joints. The technique for applying this type of repair is described below.

Preparation of a text block prior to the repair is the same as any other binding repair technique. Endleaves should be soundly attached to allow the inner hinges to be repaired if needed. The inner hinges may be repaired either before or after the outer joints are repaired. The leather around the repair must be strong enough to support a repair and should be consolidated as needed.

Boards are reinforced or reattached with a strip of the solvent-set tissue that is wide enough to cover the joint and extend onto sound leather on either side. Cut the repair strip with a needle tool or a scalpel directly on the polyester. Customize the repair strip to fit around raised bands, spine labels, or other binding features. If there are tooled lines along the joint, a repair strip carried up to a line will be less obvious. Like any joint repair, the repair strip may be flared at the head and tail to accommodate leather losses or gaps from back cornering. Additionally, more complex shapes may be cut for other repairs, such as rebuilding a lost headcap (figs. 3–4).



Fig. 5. Pressing a repair through a sheet of polyester web

Place the shaped repair strip, adhesive side up, on a non-absorbent surface, such as polyester film or acrylic sheet. Reactivate the adhesive by brushing it out liberally with isopropanol. Allow it to sit for a moment to soften the adhesive.

Transfer the reactivated tissue to the damaged area with tweezers, placing it evenly across the joint. The reactivated adhesive has sufficient slip for approximately twenty to thirty seconds to allow rapid adjustments to the placement of the strip. Gently lift the board immediately after applying the tissue to reveal the natural crease line of the joint. The repair should extend at least 2 mm on either side of the crease. If the repair is too close to where the joint flexes, the repair may lift away from the surface of the leather when the board is opened.

The just-applied tissue also may be molded to fit over three-dimensional elements, such as raised bands. Press the strip through a single sheet of polyester web (fig. 5) or work it down with a crumpled ball of the polyester web (fig. 6). Tamping or brushing the repair with a stiff brush can help work the repair into pronounced grain patterns.

Additional shaping of the repair can be done at this point by gently lifting areas with a microspatula and trimming with surgical scissors. If needed, apply a Lascaux/alcohol consolidation mix or a warm (not hot) tacking iron to reset lifted areas.

If the board is at all distorted, place small weights on the cover to keep the board flat (particularly at the head and tail) while the adhesive sets. Setting time is no more than five minutes, at which point the rest of the repair may be completed, such as turn-ins or inner hinges. Once set, the

board should be flexed fully open to see if the repair is adhered properly to the leather.

The solvent-set repair tissue may be cut flush at the head and tail or left long and turned in. If turn-ins are desired, the pastedown should be lifted to anchor the tissue underneath, since turn-ins that are only abutted to the pastedown often come loose when the joint is flexed.

The repair tissue is generally translucent enough to allow the leather color to show through. In the case of special collection materials, it may be desirable to custom tone the repair to accommodate variations of the leather after the repair has initially set. Toning *in situ* may be done with brush-applied watercolors or with thinned acrylic paints applied with a cotton swab. In cases where the repair must overlap gold tooling slightly, we use small amounts of bronze paint to extend tooled lines on top of the repairs. We have been using Golden Acrylic brand Iridescent Bronze (Fine), often applied with a needle tool.

Once the desired color is attained, the surface gloss of the repair is easily adjusted. The solvent-set tissue may be polished directly using crumpled polyester web to attain a moderate sheen. If a higher gloss is required, common coatings such as microcrystalline wax or the Leather Conservation Centre's SC6000 may be applied and buffed as needed.

Completed repairs should be allowed to rest overnight before final quality control because the solvent does not fully evaporate for several hours. The boards should be opened and the repair reexamined. Lifting areas, such as those that might occur around raised bands, are easily



Fig. 6. Pressing a repair with a crumpled ball of polyester web



Fig. 7. Three books before treatment

touched up with a warm tacking iron. If a small amount of additional adhesive is needed, the Lascaux/alcohol mix may be applied with a fine brush, allowed to dry briefly, and then set with a tacking iron (figs. 7–8).

OTHER APPLICATIONS

The basic solvent-set tissue technique is the same for other leather repairs. The tissue can be used to reinforce breaks in the spine, to cover exposed board corners, and to rebuild caps. If the repair will cover losses in the leather, any fill material used to build up thickness should be toned before the repair tissue is applied, since untoned fills will show through the translucent tissue.

The solvent-set tissue is also useful for more complex treatments and may be combined with other repair methods, such as board slotting (Clarkson 1992; Zimmern 2000), tacketing (Cains and Swift 1988), or fabric flange (Brock 2001) when rejoining detached boards of larger volumes. For a more in-depth discussion of board reattachment methods see the Discussion Group report from the *Book and Paper Group Annual* (Fredericks and Hellman 2001) and Donia Conn's comparison of board reattachment techniques (Conn 1996).

REVERSING LASCAUX 498HV SOLVENT-SET TISSUE REPAIRS

As with any surface repair on potentially weak leather, removing tissue repairs applied with Lascaux 498HV



Fig. 8. Three books after treatment

should be approached with care. Lascaux 498HV may be softened with alcohols and other solvents, and by the application of heat. Coatings of wax and/or acrylic paints may act as a barrier to solvents. One effective approach is direct application of hot air, such as is sometimes used for tape removal (fig. 9). We have used the Zephyrtronics Airpencil ZT-2, which provides a well-controlled, fine stream of hot air.



Fig. 9. Removing a repair with a hot air pencil

Though we consider these repairs to be removable, leather types and conditions will affect the ease of removal and final results. All things considered, we feel this technique is at least as, if not more, easily removed than tissue repairs applied with paste or PVA.

CONCLUSION

Repairs of damaged leather bindings require careful judgment, practice, and skill. The new material and techniques described above are only one approach to solving the common problems of leather bindings. We consider the Lascaux 498HV solvent-set tissue to be a useful addition to the broad range of repair techniques already available to conservators. It is well suited to quick repairs and batch treatments and has been used successfully to rejoin detached boards, to reinforce split joints and breaks in the spine, and to rebuild endcaps. Though the technique should be considered experimental until suitable testing of leathers treated with acrylic adhesives may be performed, it offers many advantages that warrant further investigation.

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