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NUMBER 29

FALL 1995

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# TCN



TEXTILE CONSERVATION NEWSLETTER

# TCN

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### **Disclaimer**

*Articles in the Textile Conservation Newsletter are not intended as complete treatments of the subjects but rather notes published for the purpose of general interest. Affiliation with the Textile Conservation Newsletter does not imply professional endorsement*

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## FROM THE EDITORS

### Further Notes on Painting with Irgalan Dyes

*Jan Vuori's article on painting with Irgalan dyes in the Spring TCN prompted some further experimenting at the Canadian War Museum. We wanted to see how effective this technique would be when applied to heavier fabrics.*

*To this end we "painted" on silk batiste, fine and medium weight silk twill, worsted wool challis, medium and heavy weight wool flannel, and worsted wool gabardine samples. All sample fabrics came from Testfabrics.*

*Complete dye penetration was achieved with the silk samples and the wool challis. Dye penetration correlated directly to the weight of the other samples, being less complete the heavier the weight and tighter the weave. Both the wool gabardine and the heavy wool flannel required repeated brushing to achieve any penetration.*

*Despite the lack of complete penetration with the heavier fabrics they could possibly be used for hole filling as only the surfaces would show. Mixing a series of small samples from "paint pots" as opposed to running time consuming dye baths is an added bonus, and the repair material would be easily identifiable for future conservators.*

*We also painted a large (117 cm X 52 cm) piece of silk batiste to see if the steaming process would be effective with loosely folded fabric. We made a (37 cm X 25 cm X 19 cm deep) steam box of Corplast with a nylon screen bottom. It proved successful and in further discussion with Shirley Browzky of Canaan Mohair Farms she told us about a colleague who used clothes dryer hose for the same purpose. We haven't tried that yet but it sounds like it would work quite nicely.*

*Helen Holt  
Textile Conservator  
Canadian War Museum*

In August of this year I had the unique opportunity to visit Indonesia with my husband. Java, Bali, Lombok - these are the names that, for the western world, conjure pictures of blissful tropical breezes and long white beaches. Sadly, the truth is very different from these idyllic images.

Jakarta, capital city and seat of government, is a study in the hazards of rapid development. Huge construction cranes sprout across the skyline like weird flowers, raising buildings of dramatic architectural ingenuity. At a glance it is a city of grace and wealth. A closer look reveals a sadly different story. Leaning against the construction site walls are homes cobbled from bits of tin and scrounged lumber. Euphemistically known as "informal housing", they represent the living conditions of a vast number of city dwellers.

Pollution is an appalling problem in Jakarta. Without the benefit of planned sewers or emission controls for vehicles, the air is putrid beyond imagination. It is within this stew that a largely volunteer group attempts to maintain museums.

A visit to the museums in Jakarta would break the heart of any conservator. Environmental controls consists of being able to close the windows if it rains too hard. Fumigation?...lizards run about the top of the walls collecting any insect foolish enough to get in their path. In the National Museum of Indonesia, I watched in horror as a party of children climbed over an eighteenth century table.

Surely, it is the sign of a developed nation that we place so much importance on the maintenance of our cultural heritage. Is it a sign of our slow decline that budgets for their maintenance are being eroded at every turn? Will we, in years to come, see the track of mildew darken the corners of our most cherished artifacts? Without the political will to alter this path, it seems inevitable.

While we concern ourselves with our own conditions, perhaps it is also incumbent upon us to go beyond our own scope. Just as medical people go on missions of mercy perhaps it is time for conservators to turn their attentions to the needs of these developing countries. Does a mechanism exist to assist the poor nations of the world whose beautiful collections are moldering away? By creating international awareness, is it not possible that we would create a greater awareness in our own governments? Environmentalists have done it, to great success. Why shouldn't we? A little militancy might go a long way.

LESLEY WILSON

## PAINTED FABRICS

**M**ANY unusual results can be obtained by painting various fabrics with sealing wax paint.

The paint is prepared as described on page 28. The position of the design to be painted is indicated very lightly and the painting done in the regular way.

One very popular use is the decorating of hats. The material of the hat may be silk, straw or felt and the design can be painted directly on the hat or on any trimming that is to be used. The hat at the top of the page is satin and the one at the bottom of the page is felt.

The scarf that the girl is wearing is gray georgette painted with old rose and shades of blue.

The other articles pictured show a variety of painted materials.

The window transparency is painted on white linen lawn. The outline of the design is made with raised lines. Black is used and it is applied as described in Lesson 5, Chapter 1.

A powder puff case of imitation leather, a velvet jewelry case, a velour table runner and a patent leather belt are shown as examples of a few of the fabrics that can be attractively painted.

Any wash materials that have been painted with sealing wax paint can be washed in lukewarm water without injury.



Reprinted from: Sealing Wax Craft, published by Dennison Manufacturing Co., ca.1925.

*Sealing wax paint was prepared by dissolving small pieces of sealing wax in denatured alcohol.*

# Diagrams For Costume Condition Reports

*Diagrams are especially useful since they display only the required information: type of damage and its location.*

Documenting an artifact visually, whether by drawings, diagrams, photographs or slides, is an essential part of a complete condition report. Images show more precisely than words the state of the artifact at any given time. Diagrams are especially useful since they display only the required information: type of damage and its location. However, the conservator may avoid using diagrams because of lack of drawing ability, insufficient time or both. These excuses can be especially appealing when considering the relatively complicated shapes of most costume. This article describes a quicker, more reliable method for producing accurate diagrams of costume that can give decent results without great drawing skill.

## Context

The following technique was refined in the context of a long-term, ongoing project in the Textile Conservation Laboratory at the Canadian War Museum in Ottawa. Condition reports consisting of written descriptions of the garment and its condition, diagrams to record the location and extent of damage and colour slide documentation are being produced for all pre-Boer War material in the uniform collection (approximately 650 items). With reports done in advance and assuming no further deterioration in the meantime, artifacts can be prepared more quickly when needed for exhibition or other purposes. Given their age, the pre-Boer War uniforms are more likely to be in poor condition and therefore more likely to require lengthy treatment. Documenting the condition is also more time consuming if done thoroughly. Furthermore, a complete condition report is invaluable when deciding whether a particular piece is suitable for the intended purpose. Doing condition reports beforehand when time or capable volunteers are available, thus expedites the whole process.

## Why Diagrams?

The diagram is a very practical method of documenting condition. Location, extent and type of damage is more quickly recorded accurately and clearly in diagram form than in words, especially if damage is extensive. Reading and interpreting a diagram is also easier, often more so than photographs since irrelevant information is excluded. Whether used to make decisions - should or can an artifact be used; does it need treatment and of what sort - or as a benchmark for future comparison, an accurate and easy to read diagram of an artifact's condition can improve results.

Diagrams are often used with flat artifacts including textiles. Flags and banners, samplers, handkerchiefs, rugs, tapestries and archaeological fragments, like paintings and works on paper, are usually easier to both draw and photograph than three-dimensional artifacts like costume. Sketching a rectangle or similar shape of correct proportions and outlining major areas of surface pattern or image are within the capabilities of most conservators. Alternatively, photographs can be traced or photocopied. Damage can be quickly mapped onto these images and identified with colour-coded or letter keys, or recorded on separate, copied diagrams for different types of damage.

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## Diagrams for Costume

Documenting the condition of costume is more of a challenge due to the artifacts' greater complexity. Though some pieces, such as Far Eastern robes, can be treated as flat textiles, most costume is shaped to fit the human body and will not conveniently assume neat, flat profiles of recto and verso for either the drawer or the photographer. Cuffs, lapels, overskirts and overlaps of other sorts obscure other surfaces. Gathers and pleats complicate matters further: moth larvae enjoy the hidden parts as much if not more. Fitted sleeves will simply not lay flat. Inner surfaces such as linings and pockets are even more difficult to lay out since it may not be advisable to turn the garment inside out. Yet attending to them is just as critical.

All the advantages of using a diagram for documenting condition apply as much to these artifacts, if not more so. Precise written description is tricky and laborious without top and bottom, left and right corners to refer to, although seams (especially intersections) and decoration will suffice. Reading and interpreting such a description, even one's own, is slow and susceptible to error. Reference points and directions must be located and followed correctly on a flexible artifact that presents a slightly different aspect each time it is shifted. Since there are few standard procedures for such description—the variety in clothing precludes simple guidelines—the wording will be peculiar to the writer and thus open to misinterpretation. Moreover, extensive overall damage, such as the moth damage on wool or the wear and deterioration of silks found frequently on uniforms, is impossible to describe accurately in words.

Photographs can help but have their own limitations. Some damage, such as grazed areas or pinsize holes, does not necessarily show up clearly. A complicated shape can be documented in a well chosen series of photos; but to translate it into images that lend themselves to easy copying without resulting in a jumble of disjointed views is decidedly more difficult. With some practice, a conservator can probably record damage in diagram form with less, more gentle handling than that needed to expose a suitable view for the camera.

Drawing such an artifact is demanding, but at least the conservator, when producing a diagram, can resort to means not available to the photographer. Sections can be drawn out and separated, preferably along the seams like pattern pieces as long as the diagram remains intelligible to the non-sewer. Hidden surfaces can be sketched and appended to overall views so that their relationship to the whole is not lost.

In order to assure easy and correct reading however, a diagram must be reasonably accurate. If the proportions are wrong a tear, for example, may relate properly to one seam but not to another on the other side or to surrounding damage. This may leave the reader doubtful as to what was intended. On the other hand, extreme precision is probably not necessary in most cases. The challenge is to find a method for producing diagrams that reasonably reflect the proportions of artifacts while not requiring amazing talent for drawing. In the case of collections that have numerous similar items, like the tunics, jackets, coatees, overalls and waistcoats in the uniform collection at the Canadian War Museum, a technique that would speed up production of similar diagrams is also desirable.

*Precise written  
description is  
tricky and  
laborious.*

Though an ability to draw well still helps greatly, the following technique attempts to fulfil these needs.

## Materials

The materials needed are simple and readily available: graph paper, plain white paper, measuring tape, calculator (optional), pencil and eraser. Graph paper permits quick production of scale diagrams based on a few measurements. Using a simple scale, such as 1 block = 3 cm., the conservator can map out basic proportions on either side of a vertical axis without rulers. A consistent scale allows easy comparison of all pieces from the diagrams. The garment outlines can be drawn symmetrically around the vertical axis, while the grid serves as a copying aid. Any minor asymmetries can be ignored unless absolute precision is required.

*The degree of accuracy depends on the purposes of the diagram...*

## Taking Measurements

Several vertical and horizontal measurements are sufficient to plot the critical points needed to establish correct proportions. The following are most useful: full length, length from top to lower edge of collar, to top of armhole seam, and to underarm and waist seams; width at the collar, between the tops of the armhole seams (shoulders), at underarms, waist and lower edge, and across the sleeve at the cuff and the widest part. Others can be taken to speed drawing of details of the garment, such as the height of the cuff, pockets or braid decoration. All of these figures are then translated to fit the scale of the diagram: by dividing by 3 in this case. A calculator comes in handy at this point.

The degree of accuracy depends on the purposes of the diagram and the needs of the conservator or institution. Very accurate measurements are necessary for a precise, scale diagram or may be required for other uses such as the collection of historical data. However, a reliable diagram for condition reports can be produced from reasonably accurate proportions. Measurements taken to whole or half centimetres and translated to whole, half and at most quarter boxes should suffice in most cases. With practice, the conservator may be able to sketch such diagrams very quickly with few or no measurements, if time for even this streamlined procedure is not available.

## Drawing and Recording Condition

With graph paper and the translated measurements, the conservator can draw a reasonable outline of the artifact more quickly than on plain paper. Points are plotted, based on the measurements, and the outline drawn in between, like a dot-to-dot but with carefully curved lines. Only outlines and major seams need to be drawn on the graph paper. The final drawing is worked on plain paper, eliminating the distraction of the grid. The outline is traced and the details filled in. Working over the graph paper even while drawing details permits use of the grid to speed up accurate placement, especially of symmetrical details. Often both front and back views can be outlined on the same graph image and traced separately. Linings can be traced from the same outlines with a few adjustments. Leaving the graph diagram uncluttered by details makes speedier, repeated tracing easier and allows later use of the same image for other similar artifacts. Recording a piece's measurements on its graph outline makes it easy to see if the proportions are similar enough to those of other artifacts. If so, new points can be plotted and the new

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outline drawn directly onto plain paper, using the old outline underneath as a guide to connecting the dots. A set of type drawings can greatly speed up production of condition diagrams in a project such as that at the Canadian War Museum. Complicated, frequently used details such as Austrian knots can be similarly drawn and traced whenever the size is correct.

Once the drawing of the important components is complete, the conservator can record the condition of the artifact. In this project, all drawing was done in pencil with the graph paper still below for quicker placement. Different kinds of strokes and letter codes identify the damage (see diagram). In order to keep the key simple, the categories adopted are basic types: physical damage to whole fibres (holes, losses, tears), fibre surface damage (abrasion, grazed nap), colour changes (stains, soiling, grime, discoloration), creases and fold lines, loose stitches (in seams or surface stitching). The same key is used as much as possible for all pieces even though all types of damage may not be present. The written description on the condition report further clarifies the nature of the damage with reference to the diagrams. Depending on the condition of the artifact, this part of the procedure can take as much or more time to complete than the initial outline drawing.

## Conclusion

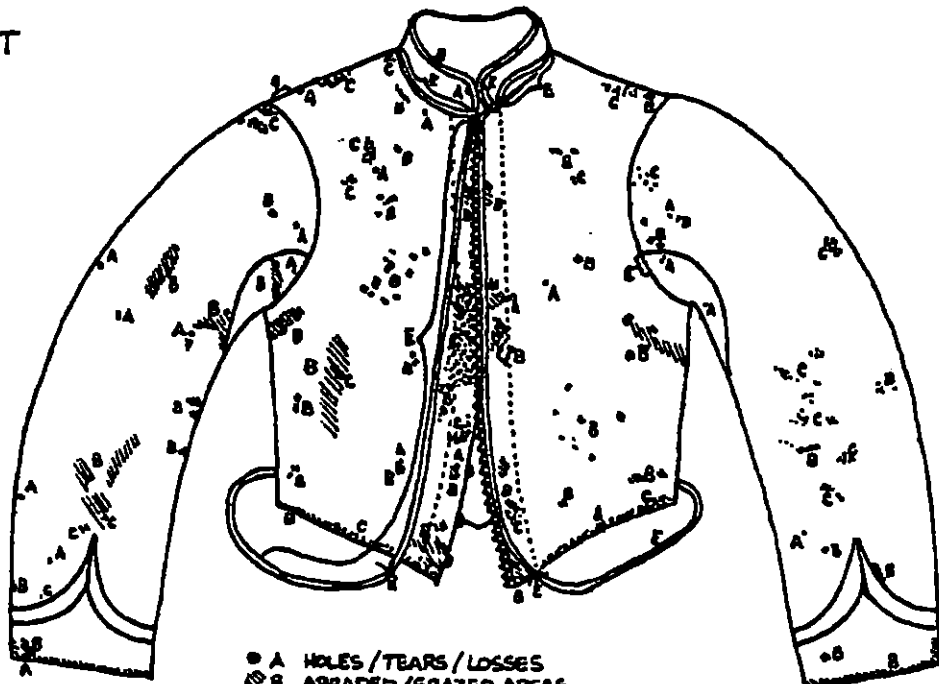
By using graph paper, a series of measurements and tracings, the conservator can produce highly accurate diagrams of garments more quickly than working from scratch each time. Since diagrams are an ideal but time-consuming method for recording the condition of costume, these techniques may make it easy enough to be worthwhile for the busy conservator. All the same, nothing helps like an ability to draw well. Even with skill it still takes a couple of hours to produce three outline views of a tunic (front, back and lining) and another couple of hours to map out fairly extensive damage. An even better technique might be a computer software program with several basic outlines on file that can be altered when the measurements of a particular garment are entered. Even so, the conservator will still have to record the damage!

Irene Karsten

*(Irene Karsten undertook this project while working as volunteer (sorely missed) at the Canadian War Museum. She is currently enrolled in the Clothing and Textiles MA programme at the University of Alberta. We wish her every success in her latest venture. Helen Holt, Canadian War Museum.)*



FRONT



- A HOLES / TEARS / LOSSES
- ▨ B ABRADED / GRAZED AREAS
- C STAINS / SOILING / DISCOLORATION / GRIME
- - - D CREASES
- E LOOSE OR FLAYED THREADS / OPEN SEAMS

LINING

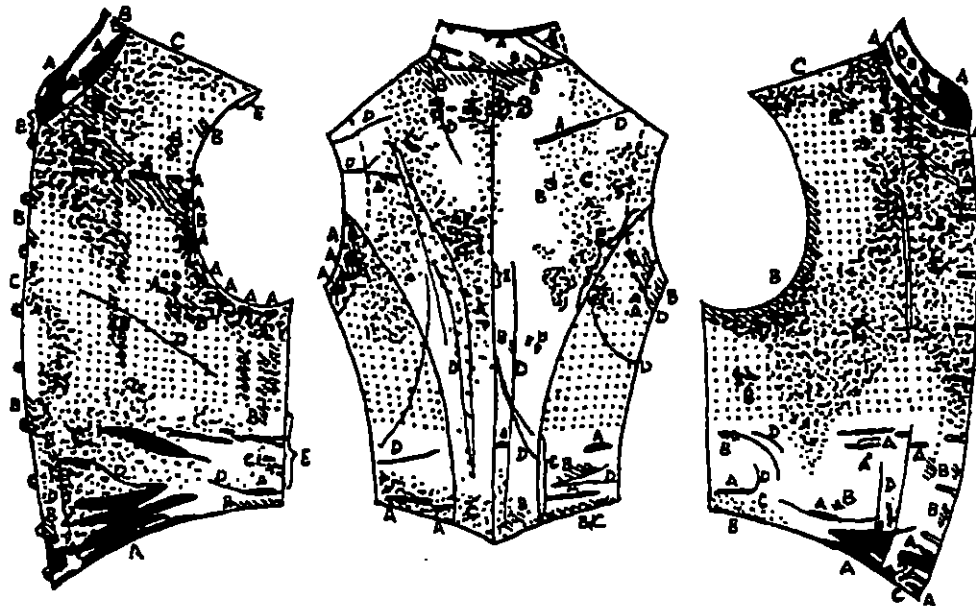


DIAGRAM: EXAMPLE OF CONDITION RECORD

## Low Interventive Upholstery Conservation at LACMA -A Crash Course-

### LOW-INTERVENTIVE UPHOLSTERY CONSERVATION AT LACMA—A CRASH COURSE\*

*ABSTRACT - Preparing for LACMA's recent exhibition "Common Forms, High Art: Three Centuries of American Furniture," the conservation staff was faced with treating over 40 upholstered chairs in four months. Most of the chairs did not retain their original upholstery, a majority had inappropriate fabrics, and many profiles were historically inaccurate. A minimally interventive approach to upholstery conservation was implemented, wherein methods and materials that are stable and easily reversible were sought. Wherever possible, the insertion of metal fasteners into the wood was avoided. This paper discusses techniques learned and applied during the project, with particular emphasis on the use of historical information, the application of carved high-density Ethafoam seat forms, covering with reproduction fabrics, and applying finishing details.*

### INTRODUCTION

Let us begin by considering for a few moments what comes to mind when we think of a chair. For most people, the chair has a specific function which is utilitarian: we sit on it. Perhaps secondarily, it also plays a decorative role: we want a chair to fit into our interior design scheme. But most people do not consider a chair to be a work of art, worthy of being preserved in its original state. This is substantiated by the frequency with which historic chairs have been de-upholstered and re-upholstered, with little or no concern for the preservation of original materials or aesthetic integrity. As a matter of fact, most upholstered 18th or 19th century chairs we encounter today bear little resemblance to their original appearance.

As conservators of historic upholstery, we must learn how to look at and to see through later upholsteries. To distinguish the rare and valuable examples of original upholstery which have miraculously survived to this day, requires training the eye to spot non-original upholstery techniques. For example, two common characteristics of the 20th century are the use of excessive padding (photo 1), resulting in profiles that look puffy (sometimes referred to as over-stuffed), and secondly, fabrics and trims chosen to suit modern tastes or modern misconceptions of the past.

To illustrate these concepts, examples will be drawn from an enormous project begun in November 1994 by the conservation department of the Los Angeles County Museum of Art (LACMA). More than forty upholstered chairs from the permanent collection and a significant promised gift, were conserved for LACMA's recent furniture exhibition entitled "Common Forms, High Art: Three Centuries of American Furniture." The exhibition opened in March of 1995, so one can calculate that 40 chairs received attention over a period of 4 months. Of course, planning for the project began nearly two years prior to that, and involved getting outside professional expertise to instruct and assist us. Included in the exhibition was a variety of period furniture from the late 17th century through the 1990's,

such as case goods, tables, and chairs, which became the highlight of the show.

This paper will discuss the techniques we learned and applied during the project, including methods which those of you familiar with the specialty will recognize as standard practice. We will also share some of the more innovative solutions and modifications that we devised in response to challenges encountered along the way.

## DECISION MAKING

Throughout the project, we sought to implement a minimally interventive approach to the conservation of historic upholstery. It would now be in order to define and distinguish between two terms often used by upholstery conservators: "non-interventive" (or "non-intrusive") and "low-interventive." The non-interventive approach involves the use of materials and techniques which specifically do not require the insertion of any metal fasteners (tacks or staples) into the wood of a chair, so no additional holes are created. This ideal non-interventive practice can easily be upheld in straightforward treatments such as removable seat bottoms or "slip seats," where the finish fabric can be pinned underneath to a foam insert. More complicated types of upholstery, however, may sometimes necessitate a low-interventive course of action, wherein a small number of metal fasteners is inserted into the wood to secure the upholstery. With this low-interventive approach, every effort is made to minimize the number of fasteners applied, and whenever possible, existing nail holes are re-used for insertion.

*...we sought to implement a minimally interventive approach to the conservation of historic upholstery.*

In this fast developing specialty, conservators are striving to advance non-interventive treatments to such a level, that the need for metal fasteners can be eliminated altogether. We are constantly searching for less intrusive alternatives. In contrast to the non- and low-interventive approaches is the fully interventive traditional method of upholstery, as practiced by upholsterers. However, irreparable damage to the wooden elements of the chair resulting from repeated upholsteries, is visible proof that traditional techniques (which rely on numerous tacks or nails to attach each layer of the upholstery) are not a suitable option for conservation. Over the years, many museums (including LACMA) have engaged in the practice of traditional upholstery, since the awareness of less damaging options is fairly recent, developing over the past 15 years or so.

*Over the years, many museums (including LACMA) have engaged in the practice of traditional upholstery...*

Beginning with careful examination of each object, we were able to make informed decisions regarding which components of a chair's upholstery might be original, and which were likely to be later additions. It is a sad but all too common fact that most of the chairs we evaluated did not retain much, if any, of their original upholstery, having undergone several re-upholsterings at different times. Still, clues as to what might have been the original finish fabric and decorative nailing pattern were sometimes found directly on the wooden elements of a chair. For instance, a small fragment of textile still attached to an original square-headed tack was found on the underside of an 18th c. slip seat frame from a New York side chair. It led us to identify a red wool fabric, which most likely served as the original finish fabric. Decorative nailing patterns were often recognized by a regular pattern of nail holes, and they were documented with tracings onto strips of Mylar. These bits of evidence proved useful during the final stages of treatment, resulting in an historically accurate presentation.

An interesting case, involving traces of decorative nailing, was discovered on the rails of a Federal mahogany side chair with missing upholstery. Textile weave impressions were

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noted in the wood in those areas that had decorative nails. It was postulated that a fairly stiff fabric must have caused the indentations, such as a fabric woven from horsehair; accordingly, a black horsehair cloth typical of the period was selected as the replacement finish fabric for the chair.

Generally, our philosophy was to de-upholster and remove materials that were not original only if they were considerably degraded, or were deemed stylistically inaccurate. Such was the case with chairs whose profiles did not faithfully reflect the aesthetic of the period in which they were made. Changing tastes over the years had often resulted in misleading re-interpretations of the appearance of a chair's upholstery. We had, for example, a pair of late 18th century chairs by Samuel McIntyre, to which 20th century style springs had been added, creating an excessively high profile. Our recreation of a more fitting profile was accomplished by omitting the springs (photo 2).

In several other cases, the non-original materials were fairly stable and retained the correct profile, so they were left in place. Minor adjustments were made by either adding or removing layers of padding. Depressions were corrected with slight pressure from a custom-fitted rigid insert underneath the seat. Whenever non-original upholstery was partially or entirely removed, it was first documented thoroughly with photographs and written descriptions. Samples of all layers were taken and kept in the object's treatment file. Moreover, we maintained a constant lookout for historical evidence. Keep in mind that those of us carrying out the de-upholstery are the only ones who will see these processes and materials, as well as the chairs in their so-called "naked" state.

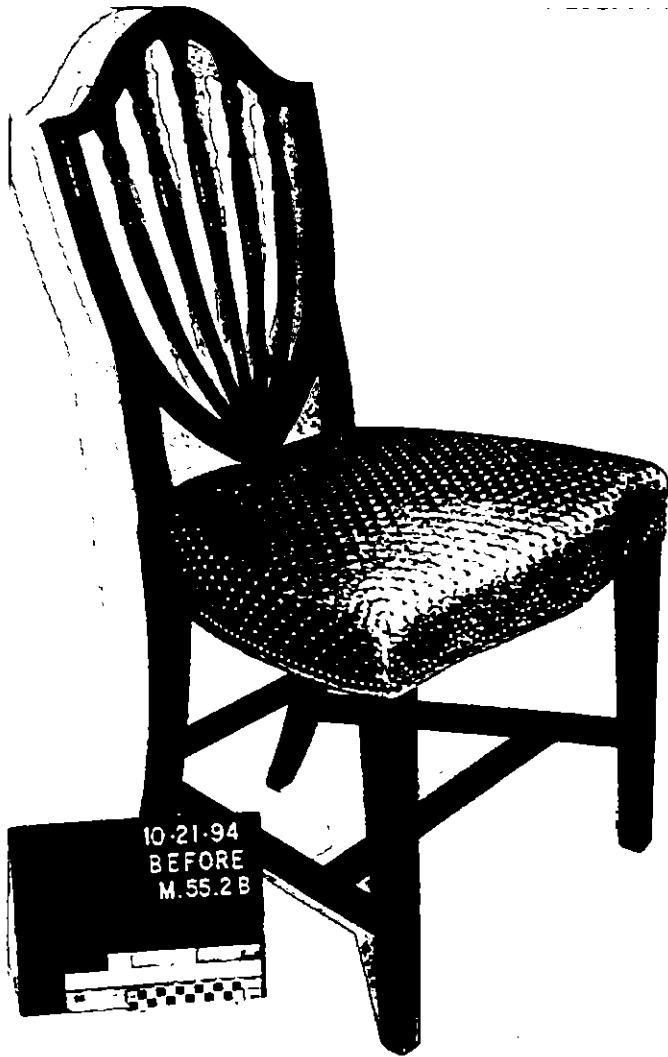
*Changing tastes over the years had often resulted in misleading re-interpretations of the appearance of a chair's upholstery.*

Examination often goes hand in hand with de-upholstery. Before discussing the mechanics of de-upholstering, it is important to realize that once de-upholstery is begun, there is no turning back, meaning that one is committed to carry the treatment to completion. As with other conservation treatments, the conservator must first be certain that the procedure is within his/her abilities. The process of de-upholstering is fairly straightforward, but time consuming. The preferred tool for removing upholstery tacks is a pair of Lindstrom oblique pliers, which have the proper angle to facilitate gripping or prying the tack heads, and a nice padded handle. Care must be taken not to dent the wood; this can be safeguarded by using a thin metal spatula as a barrier between the wood and pliers.

## RECREATING THE PROFILE

Replacement seat forms for de-upholstered chairs were carved from 9 lb. high-density polyethylene foam, which goes by the trade name Ethafoam. Ethafoam, made by Dow Chemical Corp., comes in 2 inch thick planks measuring 24 x 108", and can be pre-cut or heat laminated (with no adhesives) to any specified thickness by the distributor. This rigid material, having working properties similar to wood, allowed us to recreate historically correct seat profiles by shaping with a variety of carving tools. For those unfamiliar with upholstery conservation, the use of a hard material like Ethafoam to recreate softer, upholstered forms, may seem peculiar. Its advantages—including the stability of the polymer, ease of shaping, and reversibility as applied in treatment—explain why it has become a material of choice among upholstery conservators.

After transferring the outline of a seat shape by means of a paper template, the Ethafoam form can be cut with either a band saw, or if the plank is too wide for the throat depth, a jig saw. Both tools are useful only for cutting out the rough shape of the new seat. The



*Photo 1: Before treatment. This late 19th century chair is one of a pair possibly by Samuel McIntire from Salem Massachusetts. Note the puffy 20th century re-upholstery. (LACMA acc. #M.55.2b)*

*Photo 2: After treatment. A carved Ethafoam form, reproduction fabric and decorative nail heads create an appropriate period upholstery using low-interventive techniques. (LACMA acc. #M.55.2b)*

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jig saw has greater versatility, but for accurate cutting the blade must be kept perpendicular to the Ethafoam surface.

The Ethafoam is then subjected to a series of reductive carving operations, for which an ordinary household electric knife (like the inexpensive Black & Decker electric meat cutter) is most useful. The electric knife removes thin slices of foam, allowing for easy contouring, beveling, tapering, and rounding of edges. There are a couple of drawbacks to the electric knife: If the tool is under a constant load it can overheat and even burn out completely (allowing it to cool off periodically is recommended); also, the blade length is too short to reach the center of most forms. For those having experience with power tools, an electric router can be used to remove uniform amounts of material. Final shaping is achieved with a combination of coarse rasps, Shurform shavers, and a Japanese rasp made from hacksaw blades. These are used to smooth out rough areas, and to taper down and blend the central dome, which can not be reached with the electric knife.

Once carving is completed, the Ethafoam seat is covered with one or more thin layers of polyester batting, which help reduce its rigid appearance and provide some loft, thus lending a more natural look to the upholstery. Of course it is still rather uncomfortable to sit on such a rigid (and we might add, **sturdy**) seat, but at the same time, this provides a hidden safety factor for the chair: no one will want to sit on it, or at least not for very long.

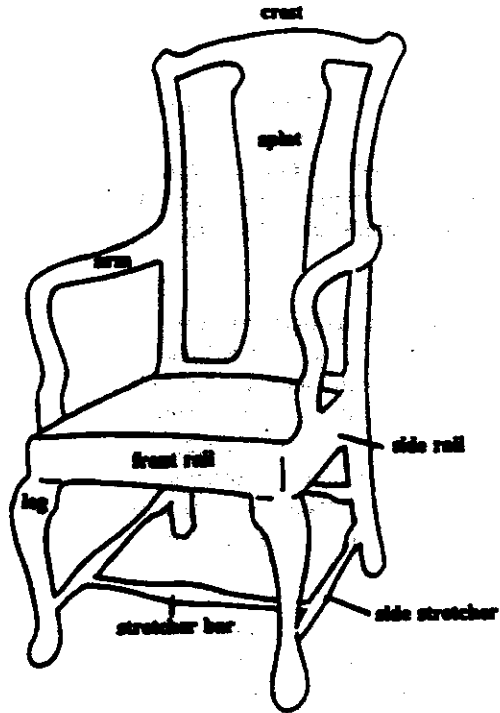
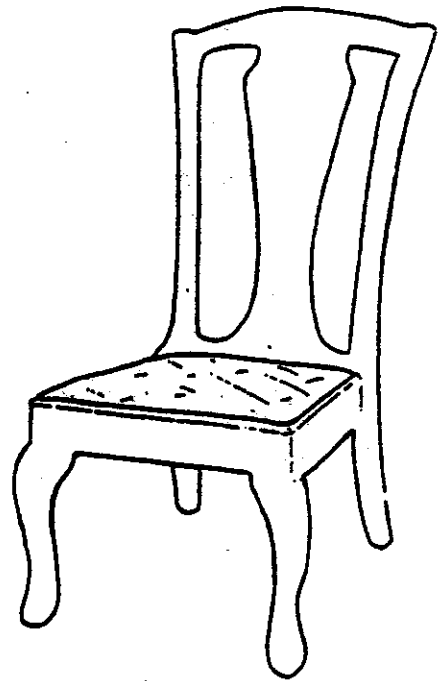
In recreating profiles, we encountered a few situations which called for more individualized solutions. For example, a slightly concave slip seat frame from an early 19th century Empire side chair required that the Ethafoam be contoured on the underside, matching the curvature of the wood. A simple, practical short-cut to create this curvature without the need for precision carving involves cutting parallel grooves in the underside of the foam with a table saw. The grooves are spaced approximately 1 inch apart, and are deep enough to allow the Ethafoam to flex easily. Because Ethafoam has a memory, it may be necessary to insert slightly wider strips of foam into the grooves, to act as wedges, giving the form its permanent curvature.

Another difficulty we encountered while applying Ethafoam seat forms to armchairs, resulted in a different innovation. Because high-density Ethafoam is completely rigid, it was impossible to insert the proper size form onto the wooden seat frame in cases where the arms protruded inward. Therefore, we developed folding "wings" in the sides of the form, which can be turned up to clear the arms of the chair for installation. Again, these wings were made by cutting grooves in the underside of the Ethafoam form. The following is our solution for securing Ethafoam inserts into the seat frames: Special brass clips were fabricated from flat stock soldered onto both ends of a threaded rod; for disassembly, the clips can be released simply by turning the unit 90 degrees or more. The flat, smooth surface of the clips prevents abrasion of the original seat frame.

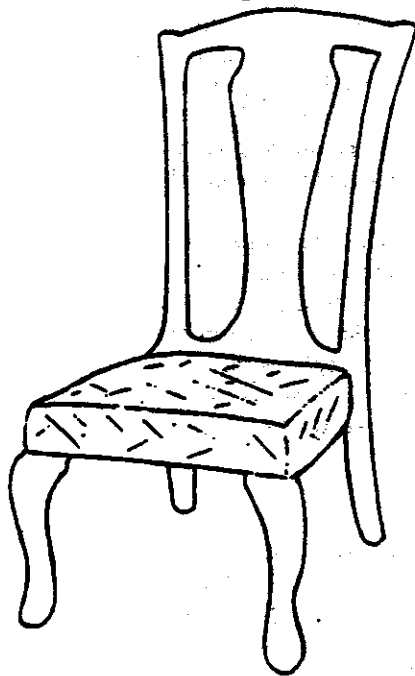
## **FINISH FABRICS AND TRIMS**

Three commonly encountered upholstery techniques of the 18th and 19th centuries are (from straightforward to more complex) the slip seat, which has a separate removable cushion with its own wooden support frame; over-the-rail, in which the finish fabric is wrapped over and around the wooden rails of the seat and secured on the underside of the chair; and finally, the most structurally complex of the three is half over-the-rail, which requires the finish fabric to be attached by some method halfway down the exposed

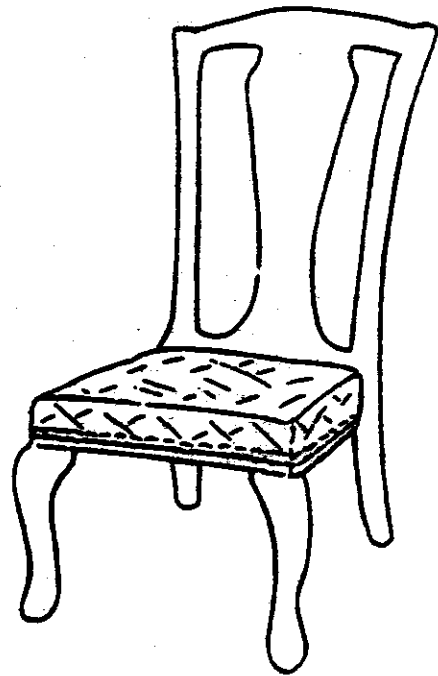
**SLIP SEAT**



**OVER-THE-RAIL**



**HALF OVER-THE-RAIL**



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wooden rails (figure 1). Often half over-the-rail upholstery is adorned with decorative trim or nails, in order to impart a finished look to the fabric edges. Most over-the-rail upholstered chairs actually contain sections that are half over-the-rail, for example around the front legs, where the fabric cannot be pulled over the wooden members. An additional technique and by far the most complex of all, is the completely upholstered chair, such as an easy chair.

Over-the-rail and slip seats have their finish fabrics pinned into the Ethafoam seat form or insert. Covering half over-rail and sections around the front legs of over-rail chairs demands a different solution, one that would be classified as low-interventive. In such cases, narrow strips of Nomex, a stiff nylon paper manufactured by DuPont, were wrapped with strips of the finish fabric, affixed with heat-activated BEVA 371 film. Then, the fabric-covered strips were attached to the rail using stainless steel staples driven by a pneumatic staple gun at low pressure. The fabric-covered strips provided a substrate to which the finish fabric could be hand-stitched in areas where half of the wooden rail would remain exposed.

*We also used a non-interventive method for fastening decorative nails onto the finish fabric.*

Finally, we should mention a few words about the finishing touches—decorative nails and trim. Decorative trim was applied using two layers of heat activated BEVA film and a heated spatula. Two layers were necessary as the heat was diffused by the thickness of the trim—one layer was applied to the finish fabric edges, and the other applied directly to the back of the trim. The two BEVA layers fused together quite easily, and a chair could be trimmed in less than four hours.

We also used a non-interventive method for fastening decorative nails onto the finish fabric. By gluing on the nail heads instead of driving the nail shanks into the wood, further damage to the wooden members of the chair was prevented. The shanks had to be cut shorter than the bottom edge of the brass head to assure good adhesive contact. A wire cutter was altered by grinding to create grooves that accommodate the cup-shaped heads of both #9 and #10 gilt and lacquered brass nails. Then the nail heads could be glued to the reproduction fabric with hot melt polyethylene glue. Another indispensable tool is a magnetic interchangeable screwdriver which is ground down just enough to hold a nail head while the hot glue is applied, and then to easily release it without pulling on the fabric.

The correct positioning of nail heads was probably the most challenging aspect of this phase, even when referring to a pattern. The system we worked out to achieve even spacing between the nails was to lightly glue on the nail heads in the desired location, leaving the option to reposition them as necessary. For final attachment, the nail heads were pulled off one at a time, and sufficient glue was added to adhere them more permanently to the reproduction upholstery fabric. Still, with rough handling the nail heads may occasionally pop off. We applied about 2,500 nail heads in two weeks, and after a while, we actually began to enjoy it.

## CONCLUSION

We have now examined the basic techniques used in upholstery conservation. Our focus has been on re-creating historically correct profiles for chairs that have not retained their original upholstery. Inappropriate upholstery materials were removed, giving careful attention to historical evidence and thorough documentation. Ethafoam was carved to the correct profile using a variety of tools. A thin layer of polyester batting was placed on the



Ethafoam, followed by the reproduction finish fabric. Decorative nail heads were glued on following a pattern left on the wooden chair rails.

Our introduction to historic upholstery conservation was indeed a "crash course". It would not have been possible without the generous assistance of Elizabeth Lahikainen, Upholstery Conservator in private practice, who taught us the basic techniques as well as undertook the most challenging projects, including a fully upholstered 18th century Philadelphia easy chair. Other project members included Curator of Decorative Arts, Leslie Bowman, and Conservation Center staff members Catherine McLean, who supervised the project, Cara Varnell, Shelley Svoboda, Irena Calinescu, and Jean Neeman, who also designed and fabricated all the special tools for the project. The furniture conservation was handled by Don Menveg and Neil Rhodes. The work was labor intensive and the cost of the project was substantial. We were fortunate that several manufacturers of reproduction fabrics donated materials, and above all, we are grateful to the J. Paul Getty Trust for funding our grant proposal, without which we could not have completed the project.

*Irena Calinescu, NEA/Mellon Fellow (Objects)*  
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*5905 Wilshire Boulevard*  
*Los Angeles, CA 90036 U.S.A.*  
*(213) 857-6169*

## APPENDIX

### Tools To Shape Ethafoam

**Jig saw** - can cut thick large pieces of material.

*drawback*- if the tool is not held perpendicular to the cutting surface, sides of the form will be cut on an angle.

**Bandsaw** - makes clean perpendicular cuts.

*drawback*- bandsaw throat can interfere with the cutting of large pieces of Ethafoam.

**Router** - takes off uniform amounts of material quickly.

*drawback*- a noisy and messy operation. It is best to wear ear plugs and a dust mask.

**Black & Decker electric meat cutter** - for slicing off large amounts of material.

*drawback*- if tool is under a constant load it can overheat/burnout. Do not "push" the tool by trying to take off too thick a slice of Ethafoam at one time.

**Japanese Saw Rasp** - *A must have tool.* It does not clog up and it shaves off fine amounts of material quickly.

*drawback*- can dig into the Ethafoam if not pushed evenly along the Ethafoam surface.

**Surform file with handle** - 15.75" long, preferably with a curved blade. Can get a sweeping action across the surface to take off fine amounts of material quickly.

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**Large Rasp** - purchase the roughest tooth available. Good for taking off fine amounts of material.

## Common Tools Customized for Upholstery Conservation

**Nail cutter** - the shanks to the brass nail heads needed to be cut down shorter than the bottom edge of the brass nail head before proceeding with the gluing operation.

Electric tools to reshape the nail cutter for cutting both #9 or #10 brass nail head shanks:

- 1) Electric bench grinder for rough shaping.

*Caution- Do not overheat the tool while shaping. Dunk tool head in water often during grinding process to keep the steel's temper.*

- 2) Dremel hand tool with burr bits for fine finishing.

**Magnetic interchangeable screwdriver** - holds the customized nail head during the gluing operation. *Caution- some magnetic screwdrivers do not have adequate magnetic strength to hold the steel shank of the brass nail head. Sears Craftsman brand works well.* While grinding down the tip of the screwdriver, constantly test to see if the tool holds the altered brass nail head with hot glue applied, and does not pull at the fabric when releasing the tool from the gluing operation.

## Other Useful Tools:

### **Hot Glue Gun** -

1) for joining Ethafoam-- Permanently joins pieces of Ethafoam together, makes extremely strong butt joints, etc.

*drawback-* it is extremely hard to fasten large surface areas of Ethafoam together because the glue cools very rapidly.

2) for gluing on nail heads-- A non-interventive approach to affixing nail heads onto the show fabric.

*Hints for applying nails with a swag pattern - A good system was to lightly glue the nail heads on the fabric in the approximate location and reposition them if needed. Then pull them off one at a time and add an adequate amount of hot glue to make them adhere properly.*

**Staple Gun** - for fastening prepared Nomex strips. A low interventive method of fastening the upholstery material to the chair frame of upholstered half-over-rail chairs. Approximately 3/4 inch wide Nomex strips are tightly wrapped with a material that blends with the upholstered fabric. The material around the Nomex strips is held in place with BEVA film that is adhered with a 120 F heated spatula or tacking iron. A staple gun and stainless steel staples secure the prepared Nomex strips onto the frame surface. Then the upholstery is pulled down to the fabric-covered Nomex strips, pinned into position temporarily, and then blind-stitched in place.

**Tacking Iron** - for gluing on the trim.

A tacking iron was used to apply 2 layers of BEVA film to the trim. The prepared trim was then ironed onto the upholstered chair.

## SOURCES FOR SUPPLIES

BEVA 371 Film- 1.0 mm thick, Talas, 213 W. 35th St., New York, NY 10001; (212) 736-7744.

Decorative nails- #9 and #10, gilt and lacquered brass, The Turner & Seymour Mfg. Co., 100 Lawton St., P.O. Box 358, Torrington, CT 06790; (203) 489-9214.

Ethafoam- 9 lb. high-density polyethylene foam, Quality Foam Packaging, Inc., 16180-T E. Gladstone St., Irwindale, CA 91706; (818) 969-7754.

Hot melt glue- 3M polyethylene glue #3764, 3M Adhesives, Coatings, and Sealers Div., St. Paul, MN 55144; (800) 373-7958.

Japanese saw rasp (for shaping Ethafoam) - Woodworkers Store, 21801 Industrial Blvd., Rogers, MN 55374; (800) 279-4441; item #49296.

Linstrom oblique cutters/pliers (for removing tacks)- Paul H. Gesswein & Co., Inc., 255 Hancock Ave., P.O. Box 3998, Bridgeport, CT, 06605; (203) 366-5400; item #182-7231.

Nomex Aramid Paper- (a nylon paper) DuPont, Wilmington, DE 19880; (800) 441-7515.

Pneumatic staple gun- Rainco Stapler #7 with longer nose, #R1A7C1650MM, used with stainless steel staples: ¼" (E704), " (E710), ½" (E712), Empire Staple, P.O. Box 7204, Highpoint, NC 27264; (800) 243-5001.

Polyester batting- Conservation Materials, Ltd., 1165 Marietta Way, P.O. Box 2884, Sparks, NV 89431; (702) 331-0582; item #979-1000.

\*This paper was first presented at the annual meeting of the Western Association for Art Conservation on 11 September 1995 in Kings Canyon/Sequoia National Park, California.

## Flame Retardant Finishes for Textiles

### Introduction

In recent years, there have been several requests at the Canadian Conservation Institute from people needing information on the necessity of applying flame-retardant finishes to textiles displayed in public buildings. To answer these questions, inquiries were made into how the fire codes pertain to objects such as historical textiles and fibre art pieces when they are displayed in public buildings. It became clear that there are no simple and easy answers, as interpretation of the fire code, and the strictness with which it is enforced, appear to vary from person to person and from place to place. The following information is intended to give people with questions pertaining to these regulations a starting point for finding the information they require. Information on flame-retardant finishes, and points to consider when deciding on their use, is also provided.

*Fire regulations  
fall under  
provincial  
regulations.*

### Fire Regulations

#### **General Information for Public Spaces**

Fire regulations fall under provincial jurisdiction. Therefore, they vary from province to province. In the case of provinces that do have a provincial code, either: the province is covered by the National Fire Code of Canada or each municipality within the province has its own fire code.

The remainder of the information in this section pertains to requirements in the province of Ontario. It is assumed that regulations in other provinces are similar to those outlined below. However, persons with inquiries outside of Ontario should confirm the regulations by calling the Fire Prevention Division of the Fire Department for the region in question.

Section 2.3 of the Ontario Fire Code states that "drapes, curtains and other decorative materials including textiles and films used in buildings shall meet the requirements for a high degree of flame resistance. According to the Fire Prevention Bureau in Ottawa, 'decorative materials' include textile art pieces displayed in public buildings. The requirements for flame resistance depends on the type of building and the location of the textile within the building. Generally, textiles cannot be hung in lobbies, exits, or evacuation routes (i.e., hallways or stairwells) unless they are

1. displayed within a cabinet, glazed frame, or plexiglas box;
  2. hung at an elevation such that they cannot be reached (i.e: ignited) by passersby;
- or
3. given a flameproofing treatment.

The textile would not be subject to these restrictions if it is hung in a room where it would not hamper exit from the building should it catch fire.

Fire regulations vary depending on what the building is used for; for example, hospitals

and prisons have more stringent regulations than other buildings. People with questions about the necessity of applying fire-retardant finishes should contact the Fire Prevention Division of their local fire department and explain the circumstances to get information specific to their needs. In Ottawa, call the Fire Prevention Bureau (Ottawa) at (613) 798-8825.

Federal Government buildings are required to conform to the latest edition of the National Fire Code of Canada. For information on fire safety requirements which pertain to federal buildings, contact Office of the Fire Commissioner of Canada (819) 953-0970.

### **Museums and Galleries**

According to the NFPA (National Fire Protection Association) Recommended Practice 911, *Protection of Museums and Museum Collections*, fire-retardant finishes are only recommended for some materials used in the construction of a building (i.e., curtains, wood shingles, materials used in exhibit construction). Exhibits using large amounts of combustible materials should also be treated. Works hanging within the galleries are not considered to be 'building materials' but rather are considered 'building contents', and as such are not subject to Recommended Practice 911. Recommended Practice 911 is presently being revised to become a legally binding Standard through official building codes, but the new Standard is unlikely to require more stringent measures concerning fire-retardant finishes.<sup>1</sup>

*...textiles hanging in museums are generally not regarded as fire hazards because they are hung in galleries, not evacuation routes.*

According to the Ottawa Fire Prevention Bureau, textiles hanging in museums are generally not regarded as fire hazards because they are hung in galleries, not evacuation routes. They are also often in display cases or otherwise isolated from the public.

For questions pertaining specifically to fire protection for collections in museums and galleries, contact:

Paul Baril, Fire Protection Advisor, Conservation Services, Heritage Services Division, CCI, at (613) 745-3760.

<sup>1</sup> *The above information on fire codes and recommended practices was obtained through Paul Baril, Fire Protection Advisor, Conservation Services, Heritage Services Division, CCI, and member of NFPA Technical Committee on the Protection of Cultural Resources.*

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## Flame-Retardant Finishes for Textiles

As shown below, some fibres are inherently more flame resistant than others:

### Flame Resistance of Textile Fibres

Cotton	Burns readily and quickly
Linen	Burns readily
Jute	Burns readily and is similar to linen
Rayon	Burns rapidly with a possible afterglow
Acetate	Burns easily and quickly
Wool	Burns slowly when flame is present, but will generally self-extinguish if ignition source is removed
Silk	Flame will splutter and self-extinguish after ignition source is removed
Polyester	Will burn slowly; the melting fibres drop off, preventing further burning
Nylon	Will shrink from flame; will melt, drip and burn in an open flame, but is considered to be self-extinguishing; these properties may be affected by finishes and dyes
Acrylic	Burns readily; will drop hot residue that can ignite other materials nearby

compiled from Joseph, M. J. (1981). Introductory Textile Science (4th Ed.)

All of the fibres listed above will burn in the presence of flame, so they likely would not pass the standard flammability test required by fire regulations. However, it is important to note that the type of fibre may dictate whether a flame-retardant finish can be successfully applied to the fabric. According to Louis Jacobini of the Flame Safe Chemical Corp. (Fort Worth, Texas), spray-on retardant finishes are very successful on polyester or cotton substrates but are highly problematic for nylon, acetate, and acrylic.

*For these reasons, their general use on historic textiles and textile art pieces is not recommended.*

Flame-retardant finishes for textiles are widely available commercially and are intended for use on curtains, carpets, upholstered furniture, and other home furnishings. They are easily sprayed onto fabric and are reported by distributors to cause little or no change to the textile's appearance. However, distributors also recommend spot-checking before treatment to ensure that the finish does not adversely affect hand or appearance, either by causing dyes to run or by changing the colour of white surfaces. Most flame-retardant finishes are readily removed by wet-cleaning, but can be dry-cleaned successfully. Whether or not the textile in question can be safely wet-cleaned or drycleaned is another matter. It is important to note that the long-term ageing properties of these finishes have not been tested. According to Dr. Nancy Kerr (University of Alberta), they may eventually change colour, become acidic, or effloresce with time. For these reasons, their general use on historic textiles and textile art pieces is not recommended.

However, as outlined above, fibre art pieces may be required to be flameproof, depending on the type of building in which they are hung and on their location within the building. For example, fibre artists may be required by their contracts to make their commissioned works flame retardant. In this case, if a commercially available retardant is applied, both the artist and the person or organization commissioning the work should be aware that such a finish may cause damage to their investment in the long term. The use of a plexiglas bonnet, case, or glazed frame would be a better option. (This is acceptable under the Ontario Fire Code, but would need to be verified in other provinces.)

### Flame-Retardant Products and Distributors

The following is a list of some neutral pH, non-toxic, flame-retardant finishes that are currently on the market. The list is not comprehensive, and there may be other equally suitable products available. Because the long-term aging properties of these products are not known at this time, their use on fibre art pieces, and especially on historic textile artifacts, is not recommended or endorsed by the Canadian Conservation Institute.

#### 1. NuQuest Guardian

Made in the U.K. for: NuQuest Marketing Inc.  
107 Franklin Way  
Hyde Park, Ontario  
N0M 1Z0  
Tel: (519) 641-8871  
Fax: (519) 641-8932

distributed in Ottawa by: Fabrizonne Clearing Systems  
571 Bronson Ave.  
Ottawa, Ontario

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K1R 6K2  
Tel: (613) 230-8499

Ingredients: a solution of inorganic salts and surfactants.

Properties (from product literature):

- translucent white liquid with slight ammonia odour
- non-toxic
- pH = 7.5

Fabrizone will sell the product to individuals to apply themselves, or will apply the product for the client. If the treatment is done by Fabrizioone, a flame-retardant guarantee certificate is issued. The process is guaranteed for three years, and the product can be removed by washing.

For clients outside of the Ottawa area, contact Joe Nash at NuQuest Marketing. Mr. Nash can advise whether the product is suitable for a client's needs and whether there is a distributor nearby. Mr. Nash says that the NuQuest system is effective on all types of fibres and does not change the appearance or hand of the fabric, and suggests that the most cost-effective way to achieve a flame-retardant finish is to have the finish applied by the fabric distributor or manufacturer. Questions regarding this option can also be directed to Mr. Nash.

## 2. Fire-Nix

Distributed by Quorum International Ltd. For product information and availability call: Kim Harper (905) 985-0876 or Brian Piggot (905) 987-4977.

### Fire-Nix Natural

Ingredients: diammonium hydrogen phosphate  
ammonium sulfate  
ammonium bromide  
sodium phosphate

Properties (from product literature):

- non-toxic
- water soluble

This spray-on product is not effective on materials with a non-porous surface such as vinyl, plastics, fibreglass, and 100% nylon.

### Fire-Nix Synthetic

Ingredients: the same as Fire-Nix Natural, but in different proportions.

Properties (from product literature):

- non-toxic
- water soluble

This product is designed for use on synthetic fibres.

Both products work best if applied in two or three light, even coatings, allowing the fabric to



dry between applications. According to distributor Brian Piggot, the finish will not alter the stiffness or appearance of most fabrics if it is applied properly.

### 3. Fabric Safe

Made and distributed by: Flame Safe Chemical Corporation  
2653 Warfield Avenue  
Fort Worth, Texas 76106  
1-800-333-9197

Closest distributors for Canada are in Rochester, NY, and Seattle, Washington (the phone number was listed in the Ottawa Yellow Pages, 1-800-333-9197).

Ingredients: aqueous-based resin

Properties (from product literature):

- clear liquid at 78°F; slight haze at 50°F and lower
- non-toxic
- non-hygroscopic
- resistant to fungal growth, and some bacteria
- pH = 6.4
- washes out

The company adjusts their formula to be compatible to a variety of textile substrates, depending on its intended use.

### 4. Inspecta-Shield

Distributed by: N.Y. Fire-Shield Inc.  
P.O. Box 7305 Auburn, NY 13022  
(315) 255-1006, (315)255-2044, or (315) 255-2763  
FAX (315) 255-2765

Ingredients: phosphate sulfate salt in aqueous solution.  
(ammonium sulfate)

Properties (from product literature):

- water white liquid, no odour
- non-toxic and non-allergenic
- contains a UV stabilizing agent which protects the substrate from fading and photo-degradation
- will not be leached out by humidity
- washes out

The treatment is effective on both natural and synthetic fibres, but the surface must be absorbent enough to allow the liquid to penetrate. This treatment is not suitable for vinyl or 100% nylon. It is important that the surface be free of dust and dirt prior to application of the finish.

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## 5. Nochar's Fire Preventer (NFP)

Distributed by: Crestline Industries Inc.  
8 Ivy Bridge  
Reisterstown, MD 21136  
(410) 526-4888  
FAX (410) 526-4889  
Contact person: Steve Sass, Vice President

Canadian Contact: Nochar, Canada  
Suite 1500 5650 Yonge St.  
North York, Ontario M2M 4G3  
(416) 226-7262  
FAX (416) 512-2230  
Contact Person: Mr. Jack Dabney

Ingredients: 'proprietary compounds in aqueous solution'.

Properties (from product literature):

- clear amber liquid with ammonia odour
- non-toxic
- pH = 7.1 to 7.7; slightly corrosive to metals
- effective on unsealed natural fibres, paper, and wood
- may be affected by both dry and wet cleaning

Mr. Sass suggests that persons making inquiries to Nochar, Canada make reference to this article, and to Crestline Industries.

Other similar flame-retardant finishes may also be on the market. Persons requiring further options can try checking their local Yellow Pages under 'Fireproofing', 'Fire Protection Equipment' or 'Flameproofing Materials'. As previously stated, it is of utmost importance to spot-test thoroughly, as some products may cause stiffening and other unwanted changes in appearance. Careful study of the product literature is also essential.

*Bonnie Halvorson*

*(Bonnie Halvorson compiled this information while working on contract in the Textile Lab at the Canadian Conservation Institute. She is currently working in the Textile Department at the Royal Ontario Museum.)*

## Textile Conservation on the "Net"

Since 1987, a steadily growing group of conservation people, including bench conservators, curators, scientists and administrators, have been meeting on the Internet to share technical information, news, rumour control, etc. relating to the conservation of museum, library and archive information.

Our numbers include more than 1500 people from at least 27 countries including conservators from several specialities, scientists, archivists, librarians and academics from a number of disciplines.

There are currently three initiatives:

1) An on-line forum, known as Cons Distlist. A moderated digest, this is issued as often as participants send in material to be distributed, usually once or twice a week. It is open to anyone who is professionally involved - and this is interpreted very liberally - with the conservation of museum materials.

2) A directory of email addresses for conservation professionals known as Conmdir. It is updated regularly and made available via CoOL (see below).

3) Conservation On-line (CoOL) This is a collection of full text databases covering a wide variety of conservation and preservation issues. It uses WAIS (Wide Area Information Server) Gopher, and World Wide Web technology to provide quick access to information from anywhere on the Internet.

These activities are taking place on the Internet, a world-wide Network of Networks (Bitnet, UUCP, etc.). If you have an account on any machine on the Net, please get in touch with me at [consdist-request@lindy.stanford.edu](mailto:consdist-request@lindy.stanford.edu) - If you are not sure how to do this, please feel free to phone me and I will do what I can to get you going.

If you are on CompuServe or MCImail instructions for getting to me are given below. If you are on one or the other commercial services call or write and I will be happy to show you how to send and receive Internet mail (alas, there are several commercial services that do not connect to the Net).

Walter Henry  
Conservation Lab  
Stanford University Libraries

[consdist-request@lindy.stanford.edu](mailto:consdist-request@lindy.stanford.edu)  
(415) 725-1140

From CompuServe  
Send to ">Internet:consdist-request@lindy.stanford.edu"

From MCIMail  
at the "To:" prompt type "Walter Henry (EMS)"  
at the "EMS:" prompt type "internet"  
at the "Mbx" prompt type "consdist-request@lindy.stanford.edu"

*Abridged and Reprinted*

## The Effect on Wool Fabrics of Multiple Freeze/Thaw Treatments for Insect Control

*Abstract: The freeze/thaw process is a convenient method for controlling the entry into a museum storage environment of materials which may have been exposed to insect infestation. Tear strength and abrasion resistance measurements on wool fabrics exposed to up to 50 freeze/thaw cycles indicate that the procedure causes no significant damage.*

### Introduction

The Relics Collection of the Australian War Memorial comes largely from donations, many of which have previously been stored under uncontrolled conditions for many years without adequate inspection. The items containing wool or feathers are very susceptible to attack by insects, especially clothes moth (Tineidae) and carpet beetles (Dermestidae), and could lead to widespread damage throughout the collection [1,2].

Increasing concern over the toxicity of pesticides to humans has meant that many chemicals formerly found effective in controlling insect infestations and protecting cultural collections from insect damage can no longer be used. Stricter safety regulations in 1984 required the Memorial to find an alternative protection system to replace the ethylene oxide fumigation chamber used up until that time on items coming into store.

Freezing of samples has been shown [3-12] to be an effective means for controlling various insect pests in a museum environment. The procedure has been used as part of an Integrated Pest Management system at the Memorial for 9 years. Newly acquired items and items returning to storage are put in a holding area and go through the freezer program as a preventive measure. This system has been very successful, with no insect infestations at the Memorial during the period. A review of the system has recently been published [13].

The procedure is to rapidly freeze the fabrics to a temperature below  $-20^{\circ}\text{C}$  in a few hours and retain the fabrics at this temperature for several days before allowing them to thaw with minimum disturbance. While causing no visual damage to textiles, this procedure has the potential to damage due to the effects of ice formation within the fabrics, especially as fabrics may be subjected to the procedure many times.

In this study an abbreviated freeze/thaw cycle has been applied up to 50 times to new wool fabrics and to a few old fabrics from the Memorial's collection. The effect on tear strength and abrasion resistance was monitored. A staining procedure was also applied to some of these fabrics and the stained fabrics assessed visually using fluorescence microscopy. The effect of freeze/thaw treatments on fabrics subjected to prior irradiation so as to simulate the effects of normal use, and of conducting the freeze/thaw treatments at varying water content, have also been studied.

## Experimental

### New Fabrics

Two fabrics were used. An undyed plain weave fabric ( $145 \text{ g.m}^{-2}$ ) and a lightly milled khaki-dyed serge fabric ( $400 \text{ g.m}^{-2}$ ). Specimens were cut to size  $100 \times 200 \text{ mm}$  (warp\*weft).

### Old Fabrics

Fabrics tested were an undyed plain weave flag fabric ( $148 \text{ g.m}^{-2}$ ), a red-dyed portion of the same fabric, a grey milled serge fabric ( $297 \text{ g.m}^{-2}$ ) from a skirt panel, and a black superfine piece ( $463 \text{ g.m}^{-2}$ ) from a pair of trousers (probably dating back to 1914-18). Specimens were cut as above.

### Equipment

Freezer (operating at  $-25^{\circ} \text{C}$ ); Instron tensile testing machine; Martindale abrasion machine; Macbeth Colour-Eye reflectance spectrophotometer.

### Pre-Treatments

- (a) Several samples of each new fabric were subjected to irradiation with a Philips ML lamp for 7 and 14 days at a distance of 20 cm from the axis of the lamp and an air temperature of  $45^{\circ} \text{C}$  [14].
- (b) Several samples were partly dried by heating in an  $80^{\circ} \text{C}$  oven for one hour, then sealed in plastic bags. Moisture content, determined from the change in fabric mass, was reduced from 10-12% to about 5% by this procedure.
- (c) Several samples were moistened by interleaving them with damp paper then removing the paper and sealing the samples in plastic bags. Moisture content was increased to about 20% by this procedure.

### Freeze/Thaw Procedure

The sealed plastic bags, which contained a maximum of 8 layers of fabric, were kept separated in the freezer. After 120 minutes freezing, they were taken out to thaw at room temperature for 90 minutes. Batches of specimens were subjected to the freeze/thaw cycle up to 50 times.

### Tear Strength

These tests, at 65% R.H. and  $20^{\circ} \text{C}$ , were conducted by the method ANSI/ASTM D2261-76, except that each sample had two 60 mm cuts in the weft direction to form three 'tongues', the gauge length was set at 75 mm and the extension distance at 150 mm. Each cut was tested, giving two warp yarn tears from each specimen. The final result is the average of the two tears.

### Abrasion Resistance

Treated samples of the various fabrics were tested on the Martindale abrasion machine at

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65% R.H. and 20° C. Weight losses were recorded after 2000, 4000 and 6000 rubs.

## Colour

The colour of the red-dyed fabric was measured before and after 50 freeze/thaw treatments. Colour difference ( $DE^*$ ) was calculated from the average  $L^*a^*b^*$  values for measurements at 4 locations on 6 thicknesses of material.

## Dyeing

Treated samples of the new light fabric were dyed for 15 minutes at 60° C with C.I. Acid Red 17 (20 mg/l at pH 3.0). The samples were rinsed thoroughly and air dried.

## Results and Discussion

### Selection of freeze/thaw cycle

In the context of the present experiment it would be impractical to prepare samples with the 2-3 days cycle used for insect protection at the museum. Using a freezer set at -25° C and 8 layers of fabric we find that the inner-most fabric reached a temperature of below -20° C within 30 minutes. Damage to fabric during the freeze/thaw cycle is most likely to occur during the rapid increases and decreases of temperature. Prolonged freezing of ancient felt fabrics for thousands of years has not caused their destruction [15].

In this study we have used a minimum of 120 minutes freezing and 90 thawing for each cycle, with some cycles being extended for several days. At the Australian War Memorial samples will be subjected to the freeze/thaw treatment up to once per year. The maximum of 50 cycles used in the current experiments should produce damage equivalent to the worst effects of the treatment on wool samples at the Memorial during the next 50 years.

### The effect of freeze/thaw treatments on new wool fabrics

The application of 50 freeze/thaw cycles to either light or heavy wool fabrics gave no measurable decrease in tear strength (Table 1, Figure 1) or increase in weight loss due to abrasion (Table 2, Figure 2). In each case the variability in results was well within what would be expected for samples showing no damage.

No increase in dye staining was observed as a result of the freeze/thaw treatments. Inspection of the dyed fabric under the fluorescence microscope showed no obvious change in dye distribution along the fibres. A more thorough study would need to be conducted to be sure that no surface cracking had taken place. Large numbers of samples would be required for such a study because of the variability of staining which occurs from the tip to the base of wool fibres.

### The effect of freeze/thaw treatments on old wool fabrics

Slight decreases in tear strength and increases in weight loss due to abrasion were observed for almost all the samples tested. The changes are less than 10% for tear

strength and for mean weight loss on abrasion (Tables 2 and 3). Most of the apparent deterioration could be accounted for on the basis of variability in the measurements. There may well also be a non-random variability in the amount of deterioration of the various parts of the samples during use. A much wider study would be required if it was desired to eliminate the possibility that changes as small as these had occurred due to the repeated freeze/thaw treatments.

Colour difference assessment on the red flag fabric before and after 50 freeze/thaw treatments indicated a colour change ( $\Delta E$ ) of 0.26 units, made up of slight increases in L, \*a\*, and b\*. Repeat measurements on the untreated fabric showed that this change was within the standard deviation of the determinations.

The effect of increased or decreased moisture content on freeze/thaw treatments of wool

Increasing the moisture content of wool from about 10% to more than 20%, or decreasing it to about 5%, has no measurable effect on the tear strength of fabrics after 20 freeze/thaw cycles (Table 3). There would not appear to be a great risk if wool fabrics are occasionally subjected to a freeze/thaw treatment while having a slightly elevated moisture content. Freezing in the presence of liquid water was not studied.

The effect of freeze/thaw treatments on irradiated wool fabrics

Wool fabric suffers considerable damage when exposed to sunlight or the artificial light source used in these experiments [14, 16, 17]. Irradiation of the light fabric for 7 and 14 days caused decreases in tear strength of 28% and 48% respectively (Table 3). Smaller decreases (3% and 16%) were observed for the heavy fabric. Up to 50 freeze/thaw cycles caused no significant further decrease in tear strength for any of the irradiated fabrics.

The lack of further damage to the irradiated wool fabrics due to freeze/thaw treatments is a further indication that older historical fabrics are not likely to be damaged by such treatments.

## Conclusion

The treatment of new wool fabrics with up to 50 abbreviated freeze/thaw cycles caused no apparent damage as measured by tear test, abrasion and a stain test. Prior irradiation treatment, or the presence of up to 20% moisture, did not lead to damage during the freeze/thaw treatments.

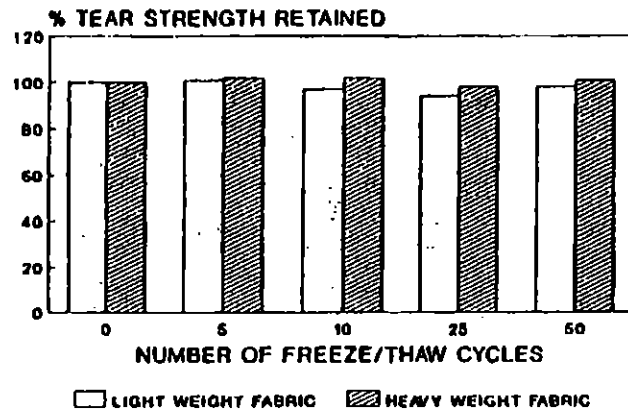
Decreases of less than 10% in tear strength and abrasion resistance were observed when samples of old wool fabrics were subjected to up to 50 freeze/thaw treatments. In view of the uneven wear that the fabrics may have been subjected to prior to the freeze/thaw treatments, the changes are probably too small to be significant. Negligible colour change was observed when a red-dyed flag fabric was subjected to 50 freeze/thaw treatments.

Leo A. Holt\*, Chen Yi\*, and Wendy Dodd\*\*

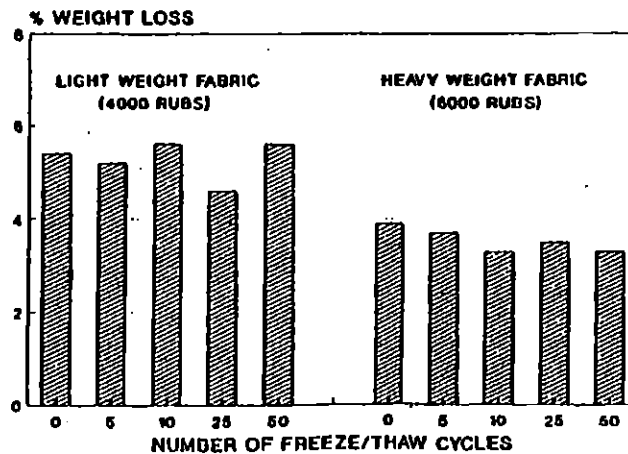
\*C/-Agriculture School, La Trobe University, Bundoora 3083, Victoria, Australia.

\*\*Australian War Memorial, P.O. Box 345, Canberra ACT 2601

**FIGURE 1**  
Freeze/Thaw Treatments  
Effect on Tear Strength of Wool Fabrics



**FIGURE 2**  
Freeze/Thaw Treatments  
Effect on Martindale Abrasion of Wool Fabrics



**TABLE 1**  
The Effect of Multiple Freeze/Thaw Treatments at Normal Regain  
on the Tear Strength of New Fabrics

FABRIC	FREEZE/THAW CYCLES	TEAR STRENGTH (kg)	% TEAR STRENGTH RETAINED
LIGHT	0	2.35 ± .09 (16)	100
	5	2.38 ± .06 (8)	101
	10	2.27 ± .07 (8)	97
	25	2.22 ± .15 (8)	94
	50	2.31 ± .10 (8)	98
HEAVY	0	4.85 ± .14 (16)	100
	5	4.94 ± .08 (8)	102
	10	4.94 ± .16 (8)	102
	25	4.76 ± .11 (8)	98
	50	4.90 ± .17 (8)	101

NUMBER OF TEST SAMPLES SHOWN IN BRACKETS

**TABLE 2**  
The Effect of Multiple Freeze/Thaw Treatments  
on the Abrasion Resistance of New Fabrics and Museum Samples

FABRIC	ABRASION CYCLES	FREEZE/THAW CYCLES	AVERAGE WEIGHT LOSS (mg)	WEIGHT LOSS (%)
NEW FABRICS LIGHT	2000	0	4.0	2.3
		5	3.8	2.2
		10	4.5	2.7
		25	4.0	2.4
		50	4.8	2.8
LIGHT	4000	0	9.3	5.4
		5	9.0	5.2
		10	9.5	5.6
		25	7.8	4.6
		50	9.5	5.6
HEAVY	6000	0	17.8	3.9
		5	16.8	3.7
		10	15.3	3.3
		25	16.3	3.5
		50	15.3	3.3
OLD FABRICS FROM WAR MEMORIAL COLLECTION UNDYED FLAG	2000	0	11.8	6.9
		50	12.6	7.3
	4000	0	17.1	10.1
		50	18.9	11.0
GREY SKIRT	4000	0	12.1	3.6
		50	12.5	4.3
BLACK TROUSER	4000	0	27.0	5.3
		50	27.0	5.2

4 TESTS ON EACH SAMPLE



**TABLE 3**  
**The Effect of Multiple Freeze/Thaw Treatments**  
**on the Tear Strength of Pre-treated Fabrics**

FABRIC	FREEZE/THAW CYCLES	TEAR STRENGTH (kg)	% TEAR STRENGTH RETAINED
<b>NEW FABRICS AT 5% MOISTURE CONTENT</b>			
LIGHT	0	257 ± .02 (4)	100
	10	237 ± .12 (4)	92
	20	244 ± .07 (4)	95
HEAVY	0	4.94 ± .00 (4)	100
	10	5.08 ± .02 (4)	103
	20	4.99 ± .01 (4)	101
<b>NEW FABRICS AT 20% MOISTURE CONTENT</b>			
LIGHT	0	2.33 ± .03 (4)	100
	10	2.51 ± .06 (4)	108
	20	2.51 ± .06 (4)	108
HEAVY	0	5.19 ± .07 (4)	100
	10	5.30 ± .05 (4)	102
	20	5.22 ± .07 (4)	101
<b>FABRICS IRRADIATED 7 DAYS WITH PHILIPS ML LAMP</b>			
LIGHT	0	1.70 ± .03 (4)	100
	10	1.66 ± .03 (4)	98
	50	1.81 ± .01 (4)	106
HEAVY	0	4.71 ± .15 (4)	100
	10	4.63 ± .01 (4)	98
	50	4.69 ± .08 (4)	100
<b>FABRICS IRRADIATED 14 DAYS WITH PHILIPS ML LAMP</b>			
LIGHT	0	1.23 ± .03 (4)	100
	10	1.22 ± .03 (4)	99
	50	1.36 ± .03 (4)	111
HEAVY	0	4.09 ± .09 (4)	100
	10	4.09 ± .01 (4)	100
	50	4.21 ± .16 (4)	103
<b>OLD FABRICS FROM WAR MEMORIAL COLLECTION</b>			
UNDYED FLAG	0	3.43 ± .17 (8)	100
	10	3.58 ± .14 (8)	104
	25	3.12 ± .14 (8)	91
	50	3.21 ± .12 (8)	94
GREY SKIRT	0	1.89 ± .11 (8)	100
	10	1.87 ± .07 (8)	99
	25	1.87 ± .06 (8)	99
	50	1.85 ± .06 (8)	98

NUMBER OF TEST SAMPLES SHOWN IN BRACKETS

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### Biographies

*Mr. Leo Holt obtained a B. Sc. degree from the University of Melbourne in 1968. Until 1991 he was Principle Research Scientist at CSIRO in the Divisions of Protein Chemistry and Wool Technology. He has published over 70 papers on subjects including assessment of various UV-absorbers, glasses and other filters for control of sunlight damage to wool, penetration of reagents into the wool fibre, and safe methods for prevention of insect damage to wool. Since 1992 he has worked as a private consultant for UV Eclipse Pty Ltd. and is currently engaged on wool and specialty animal fibre projects with La Trobe University, School of Agriculture.*

*Ms. Chen Yi obtained a B.Sc. degree from the China Textile University in Shanghai in 1984. She is currently working towards a higher degree at La Trobe University, School of Agriculture on the topic of surface properties of cashmere and mohair fibres.*

*Wendy Dodd is senior textile conservator at the Australian War Memorial where she has worked for ten years. She has a degree in Applied Arts from Canberra Institute for the Arts, majoring in textiles. In 1987 she received a Churchill Fellowship to work in conservation at the Victoria and Albert Museum, London and to visit museums in England, Scotland, Switzerland and France.*

*(Editor's Note: This article first appeared in the AICCM Bulletin, Vol 19 No 1 & 2, and is reprinted here with their kind permission.)*

## Recent Activities in Textile Conservation Research at CCI

Having received many requests to conduct research into problems affecting the conservation of textiles, the Canadian Conservation Institute has begun to focus more of its research efforts in this area. As part of the research program, CCI consulted with clients who are concerned with textile conservation. Since January 1995, two meetings have been held and a number of verbal and written comments have also been received. These consultations gave feedback on the research program, guidance for future work, and identified research priorities. We hope in this way that the research addresses the needs of the Canadian textile conservation community.

The first meeting was held at CCI on February 8, 1995 at CCI, where 19 conservators and scientists from CCI met with a group of 7 textile conservators from the Ottawa/Montreal area. A second meeting was held in Calgary, as one of three concurrent discussion groups during the IIC-CG annual conference, on May 28, 1995. Fifteen participants and three CCI representatives, Charlie Costain, Janet Wagner and Season Tse were present. Verbal and written suggestions were also received from 5 conservators who were not present in the two meetings.

A notable result of this effort was the opportunity for professional exchanges among textile conservators, scientists, educators and collection managers. CCI provided an update of our recent research activities. We also identified the areas which cause the greatest concerns among our clients. The following gives a brief summary of the suggestions from the consultations, and a response from CCI, indicating our capabilities within the next few years. The concerns and suggestions for research have been divided into 3 categories: high priority, medium priority and areas of interest.

### High Priority

#### Wet cleaning of historic textiles

Studying various aspects of wet cleaning of historic textiles is considered to be the highest priority for most textiles conservators we spoke to. While washing of cellulosic textiles is commonly done, the area that needs the most research is in the wet-cleaning of proteinaceous textiles.

At CCI a great deal of work has been carried out on the washing of paper. What we learnt from that will form a good basis for cellulosic textiles. Certain aspects of washing of cellulosic textiles will be answered by Season Tse's current project on washing of cellulosic textiles. Other areas such as duration of washing and long term effect of additives and detergent residues will be studied in future work. CCI has established analytical methods to evaluate cellulosic textiles, similar studies involving protein fibres is pending the development of suitable analytical methods by Gregory Young.

#### Choosing the suitable water purification system

Very closely related to wet-cleaning is the question of water quality and water purification. Requests for a CCI publication on this topic are overwhelming, both among the textile and the paper conservation community (report for Paper Research Focus Group Meeting -1994, Kleinburg). Conservators are looking for guidelines to help them choose from the myriads of water purification systems that are commercially available.

A CCI Note will be prepared in order to help conservation labs make a suitable choice.

While the note is in progress, you can contact Season Tse for advice relating to water purification systems.

## Materials for preventive conservation

There were many requests for CCI to provide guidelines for selection of plastic storage and display materials, and choice of storage systems. Conservators and collection managers are eagerly waiting for the CCI publications: "Handbook of Plastics for Use in Preventive Conservation" (by Scott Williams) and "Enclosures" (by Stefan Michalski).

Many of the concerns about storage materials and enclosures will be addressed by these two publications. CCI planned to have "Enclosures" available by the end of 1995. Publication in electronic format of the "Handbook of Plastics for Use in Preventive Conservation" is also planned. CCI will not be carrying out major research in the area of storage system fabrication. Beyond specifications for storage systems, clients are advised to contact manufacturers.

## Guidelines for Exhibition

Many museums are exhibition-driven, several conservators expressed the need for 'proof' of detrimental effects of certain display conditions and duration of exhibition, in order to lobby for changes. Damages include fading of certain colorants, discolouration of textile fibres resulting from extended light exposure, and physical damage caused by stress during exhibition or use of the artifacts.

Acceptable light levels for exhibition are well established in general terms, but defining appropriate exposure times for particular materials and media is more problematic. CCI has no plans for long term research in this area. The use of the microfading apparatus for predicting light damage of artifacts could provide some of the needed evidence. Development of IR and thermal analytical techniques are expected to be useful for monitoring the state of degradation of protein fibres under exhibition conditions.

## Protein fibre degradation

Development of analytical methods to evaluate silk and wool degradation is fundamentally important, in order to answer questions about the effect of treatments, such as the washing of silk and wool, and display and storage conditions.

Greg Young will continue to develop thermal-analytical and infrared microanalytical methods for silk. After-treatment evaluation of the Gondar Hanging will be the first step towards developing these techniques. There are also future plans for Season Tse to establish chemical and biochemical methods to evaluate treatments for silk and correlate the results to physical measurements. It is uncertain when the chemical evaluation will begin.

## Consolidants

There are a number of requests for development and evaluation of methods for consolidating painted, as well as highly degraded and fragile textiles.

The ultrasonic mister has been successfully used in treating ethnographic materials and friable media on works of art on paper. The Textile Lab at CCI will be evaluating this method as a treatment for painted textiles. The use of parylene, as a last resort, to consolidate weighted silk fragments has been evaluated both by Bonnie Halvorson, and David Grattan and the textile lab at CCI. While there were no general recommendations for treatment of all textiles, the method was

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useful for highly degraded silk artifacts. POLYOX was successfully used to consolidate archaeological wool fragments. There are no plans for more work on parylene or POLYOX consolidation of textiles.

## Adhesives

Adhesive research continues to be important to most textile conservators. The long term interaction of adhesives on textile artifacts and removability are the main concerns when it comes to using adhesives in their treatment plan.

Jane Down and Ela Keyserlingk offer a seminar on Adhesives Used in Textile Conservation. Many of the issues listed above are addressed in the seminar. Jane will be continuing her work on the stability of adhesives based on vinyl acetate ethylene (VAE) copolymers with various modifiers. Up to the present time, CCI has not investigated the properties of any adhesives with relation to any substrates. These application aspects of the project will best be addressed after the stability question has been answered.

## Medium Priority

### Stain removal

There is a lot of interest in the removal of various stains, such as rust, glue and starch stains from wool and silk.

In the past, CCI has done quite a lot of work on various aspects of stain removal on paper artifacts. These include the extensive work on bleaching, removal of iron stains using reducing agents and the use of enzymes for removal of starch and protein stains. These techniques are applicable to cellulosic textiles. Evaluation of the effect of stain removal procedures on protein fibres requires sensitive analytical procedures, and it is in CCI's plans to develop these methods.

### Suction table

The suction table has been invaluable in paper conservation treatments such as stain removal and local treatments. The Textile Lab at CCI will be developing methods for textile conservation treatments using this tool.

## Areas of Interest

### Composite and modern materials.

There are many questions about treatment, stabilization, storage and display of composite and modern materials such as metallic threads with cotton or silk core, buttons and sequins, synthetic fibres, painted textiles and rubberized fabric.

There are a number of CCI notes dealing with care and storage of metals, cellulose nitrate- and rubber-containing objects. Treatment strategies for composite objects can vary widely depending on many factors. Requests for assistance on such projects may be best addressed by consultation with CCI staff on a case-by-case basis. While CCI has no immediate plans to carry out long term research projects on these topics, Scott Williams, David Grattan, Malcolm Bilz and Jean Tétreault will be able to provide expert advice.

### Colour monitoring

Colour monitoring of artifacts using a Minolta Chromameter is being carried out by

conservators who wish to follow colour changes resulting from treatments or display conditions. There is a need for better understanding of the capability and limitations of the techniques and the instruments. There are suggestions for a basic CCI workshop on how to use colour monitoring equipment, how to carry out colour measurements and how to calculate and interpret the data. A CCI Note on colour measurement has also been suggested. These possibilities are being evaluated by CCI.

#### Fire-proofing of fibre art

This is an area that is not well studied. At the University of Alberta, Dr. Nancy Kerr supervised a graduate research project looking at the effect of some fire retardants on cellulosic materials. It was suggested that more follow-up work on testing recent fire-retardants on various types of textile fibres, in addition to cellulosic fibres, could be carried out.

While at CCI, Bonnie Halvorson has put together an information package on various aspects of fire-proofing of textiles artifacts. CCI has no plans to evaluate the long term effect of fire retardants on textiles. However, the chemical components of these retardants can sometimes be indicative of potential hazards for textile fibres. Scott Williams may be able to provide general guidelines for choosing fire retardants based on the components in the formulations.

#### Identification of highly degraded cellulose fibres

There are two post-graduate projects supervised by Dr. Nancy Kerr, at the University of Alberta which deal with identification of highly degraded cellulosic fibres. CCI currently uses microscopy and infrared spectroscopy to distinguish different fibre types (vegetable, animal or synthetic fibres), and do not have future research plans in this area.

In general, conservators are placing more emphasis on preventive measures, and short term treatments. This is a reflection of the current climate of lack of time and resources for long and involved (and expensive) treatments. It was emphasized that CCI research must result in practical recommendations for treatments, choice of materials and guidelines for collection care. Some conservators find it difficult to make the leap from experimental results to the everyday handling of the objects.

The role of CCI is to be a resource for the conservation community, both in carrying out research and providing information. It was pointed out, both in the Paper and Textile Research Focus Group Meetings, that there is a need for better communication and more effective dissemination of information/knowledge. These focus group meetings are one way to begin a dialogue with our clients and to establish/re-establish contacts. More frequent updates of CCI activities in various newsletters (eg. CCI Newsletter and Textile Conservation Newsletter) will also be helpful.

Participants were very appreciative of CCI's effort in organizing these meetings. There was general support for CCI's current research projects as well as future plans. To obtain the Textile Research Focus Group Report, a more detailed account of these meetings, please send your request to Cliff McCawley, Director of Conservation Research Services at CCI. If there are any suggestions and comments regarding these focus group meetings, please contact Cliff McCawley.

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## Textile Conservation at Glenbow

The restructuring of Glenbow in the spring of 1993 resulted in the loss of the permanent textile conservator position at the museum. Storage and exhibition of textiles still play a part in the activities of the museum, so how has Glenbow been caring for this part of the Collection?

Since 1993 we have hired textile conservators on a temporary or contract basis to carry out treatment work for a number of artifacts on exhibit. We have also contracted out the construction and dressing of mannequins to a conservation technician who is experienced in mannequin-making. Except for a couple of instances, the work on the artifacts has taken place in the conservation lab at Glenbow rather than off site. A policy to deal with contract work on artifacts has been written and states, that, whenever possible, work on artifacts (including conservation and mount-making) will be done on Glenbow premises.

No treatment work for textiles in storage has been done recently, although there is a small budget for textile conservation if the need arises. A storage upgrade in our Cultural History collection this past year resulted in improved storage and access for our Folk Studies artifacts including textiles. The textiles are now properly rolled or stored on customized mounts. Mount making and rolling of the textiles was mostly done by collection technicians and volunteers. While there is a plan to upgrade all of our textile storage in the Cultural History collection, we are still seeking to secure funding for this important project.

Heather Dumka  
Conservator - Artifacts  
Glenbow Museum





## Not All Mothballs Are Created Equal

Two different chemicals, paradichlorobenzene (PDB) and naphthalene, are used for mothballs, restroom deodorant blocks, and similar purposes. They both have a characteristic "mothball" odour. Most people can detect the odor of naphthalene at about 0.04 parts per million (ppm), and PDB at about 0.12 ppm. This means both can be detected before their Threshold Limit Values (TLVs). The TLVs for both chemicals are very low (10 ppm) indicating they are very toxic. Since both have the same TLV, it is necessary to compare other qualities in order to choose the least toxic chemical.

Naphthalene can cause anemia, liver and kidney damage. Its ability to cause cancer is debatable based on a single National Toxicology Program (NTP) two-year inhalation study. This study showed no evidence of carcinogenic activity in male mice, but showed some evidence<sup>1</sup> of carcinogenic activity in female mice. If it is a carcinogen, it isn't showing evidence of being a potent one.

PDB's primary effects are on the respiratory system and liver. Cancer studies of PDB have been reviewed and the evidence is clearer. NTP places PDB in Category 2<sup>2</sup>, the National Institute for Occupational Safety and Health (NIOSH) lists it as a carcinogen<sup>3</sup>, and the International Agency for Research on Cancer (IARC) lists PDB in category 2B<sup>4</sup>.

Comparing these data tips the scale in favor of using naphthalene with one major reservation. Naphthalene is highly toxic causing severe anemia in certain people of Black (other than Australian Aboriginal), Mediterranean, and Semitic origins with genetic glucose-6-phosphate dehydrogenase deficiencies. People with this genetic condition should avoid exposure to naphthalene.

1. The NTP uses five categories of evidence of carcinogenic activity to summarise the evidence observed in each animal study: Two categories for positive results (clear evidence and some evidence); one category for uncertain findings (equivocal evidence); one category for no observable effects (no evidence); and one category for studies that cannot be evaluated because of major flaws (inadequate study).
2. After studies have been evaluated, the NTP has two categories of carcinogens: 1) known to be carcinogenic from human studies; and 2) reasonably anticipated to be carcinogenic, with limited evidence in human or sufficient evidence in experimental animals.
3. NIOSH-X: carcinogen defined with no further categories.
4. IARC-2B: 'possibly carcinogenic to humans; limited human evidence in humans in the absence of sufficient evidence in experimental animals.

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## Thesis Research - Can You Help?

Shawna Lemiski, a graduate student in the Department of Human Ecology at the University of Alberta, is conducting her thesis research on the degradation of weighted silk. One of the goals of the research is to develop a set of guidelines for the handling, storage and display of weighted silks that will advise textile conservators and collections managers in the preservation of these artifacts. The study will include examination and testing of both historic, naturally aged silks and new weighted silk artificially aged with light.

In order to have a sufficient number of historic silk samples for testing, Ms. Lemiski is seeking donations of degraded silks from approximately 1870-1940. Because the testing may be destructive, the samples should be from discarded or deaccessioned items, not from artifacts that belong to museum collections. The pieces do not have to be large, as even 5 cm X 5 cm is adequate for some types of analysis. All donations will be acknowledged, and donors will receive a summary of results in the spring. If you are able to contribute to this research project, please contact Ms. Lemiski as soon as possible or send your sample(s) with a brief note about the source and date of the silk if possible.

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The TEXTILE SOCIETY OF AMERICA (TSA)'S Fifth Biennial Symposium, titled "Sacred Textiles", will consider a broad range of textiles related to rituals practised throughout all parts of the world. It will take place September 18-22, 1996 at The Art Institute of Chicago.

For information, contact co-chairs:

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## FABRIC OF AN EXHIBITION AN INTERDISCIPLINARY APPROACH

### TEXTILE CONSERVATION SYMPOSIUM '97

The Canadian Conservation Institute, Department of Canadian Heritage, is hosting the first biennial North American Textile Conservation Symposium from September 22 to 25, 1997 in Ottawa, Canada. Curators, designers, conservators and other museum professionals will address issues related to the successful exhibition of textiles. Aside from the formal presentations and poster sessions, tours of museums and facilities in the Ottawa area and demonstrations of techniques will be offered. The proceedings of this symposium will be published after the conference.

An international call for papers will appear in the spring of 1996, however, early submissions are welcomed.

To receive further details, please write to:

Michaela Keyserlingk  
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## TCN Subscription Form

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All submissions should be typed or, preferably, forwarded on an IBM compatible 3.5" disc in Wordperfect (Windows or DOS) 4.2, 5.0 or 5.1 format. The disc will be returned. Inquiries, submissions and address changes should be sent to:

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<u>Mannequins for the Royal Ontario Museum Gallery</u> <i>Alexandra Palmer, Textile Department, Royal Ontario Museum, 1987</i>	Spring 1988
<u>Warning! Dichlorovos Resin Strip Fumigation</u> <i>Sharon Hammick, Conservation Department, Royal British Museum, 1989</i>	Spring 1989
<u>Recent Trends in Costume and Textile Storage</u> <i>Jaquelin Beaudoin-Ross, McCord Museum of Canadian History, and Eva Burnham, Canadian Conservation Institute, 1990</i>	Spring 1990
<u>The Effects of Substrate Variation on Colorimetry Readings</u> <i>Leslie K. Redman, Canadian Museum of Civilization, 1990</i>	Spring 1991
<u>Characterization and Preservation of Weighted Silk</u> <i>Merrill Horswell et al, Department of Environment, Textile and Design, University of Wisconsin, 1992</i>	Spring 1992
<u>Conservation of an Egyptian Mummy Shroud</u> <i>Isabella Kravski and Diane McKay, Royal Ontario Museum 1992</i>	Spring 1993
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ISSN 11-80-3649

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