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# A Note on the Use of Vacuum Clamping to Treat the Damaged Parquetry on a Bombe Writing Desk

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*Fulford Place in Brockville, Ontario is home to a turn-of-the-century Louis XV style "Bureau de Dame" bombe writing desk. This composite artifact consists of a wooden carcass, a variety of veneers, metal ornament or ormolu, a clock, and wired candelabra lights. This technical note focuses primarily on the manner in which lifting and replacement veneer was re-attached to the substrate using a vacuum clamping method. This method is suitable for curved surfaces and other areas that are problematic to clamp. While the technique is not new, vacuum clamping has more applications than was previously realized. A description is provided of the procedure and the materials required.*

*Fulford Place à Brockville, en Ontario, abrite un secrétaire galbé de style Louis XV, aussi nommé «bureau de dame», datant du tournant du siècle. Ce meuble est composé d'une charpente en bois, de différents placages, d'ornements métalliques (similor), d'une pendule et de candélabres équipés d'ampoules électriques. Cette note technique porte principalement sur la façon dont les placages qui se soulevaient ou les placages de remplacement ont été fixés au substrat à l'aide du serrage sous vide. Cette méthode est particulièrement appropriée pour le traitement des surfaces bombées ou autres surfaces ne se prêtant pas à l'utilisation de serre-joints. Bien que le serrage sous vide ne constitue pas une nouveauté, ses applications en conservation sont plus nombreuses que ce que l'on avait cru jusqu'à présent. Une description du procédé et des matériaux requis est présentée.*

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## Introduction

Fulford Place, one of the few remaining Edwardian mansions in North America (**Figure 1**), was built in Brockville, Ontario in 1899 by Senator George Taylor Fulford. Funding for its construction was made possible by Senator Fulford's "cure all" remedy, "Pink Pills for Pale People," which he successfully marketed worldwide. Designed by Albany architect Albert Fuller, Fulford Place houses an original collection of over 8,000 artifacts in a wide variety of international styles. The mansion and its collection are the property of the Ontario Heritage Foundation.



**Figure 1.** Fulford Place, Brockville, Ontario, 1911 (Photograph courtesy of the Ontario Heritage Trust).

## The Writing Desk

The Rococo style bombe writing desk is an eye-catching furniture showpiece in the Fulford Place drawing room (**Figure 2**). The word "bombe" is a French term meaning convex, curved, or bulging. In relation to furniture, the term is used to describe the bold, convex curve on the lower part of a cabinet. The desk consists of compound curves, a combination of both convex and concave surfaces.

The bombe desk was originally misinterpreted to be the product of a large scale mass production, entirely machine-made, and was brought to the Canadian Conservation Institute (CCI) as a training piece for students. During close examination, however, elements were discovered that indicated great attention to detail, such as hand-scribed markings, layout and witness marks, which are not typically found on a mass-produced object. These marks are typical of single piece production in a small, well-equipped atelier. Even the curvilinear design of the hardware, such as the drawer handles, is in keeping with the overall form of the desk. The carcass of the desk is constructed of pine, and the veneer, which is referred to as parquetry because of its geometric design, is made of mahogany and rosewood. Even here, the curvilinear design elements follow the order of the whole.

The legs, side arms, and top of the desk are adorned with gilded brass ornament,<sup>1</sup> commonly referred to as ormolu (**Figure 3**). Sweeping leaves, angels, and wired candelabra entwine to form an elegant ensemble of nearly symmetrical decor. Individual sculptures were investment cast as the hollow



**Figure 2.** Bombe desk in the Fulford Place drawing room. (Photograph courtesy of the Ontario Heritage Trust)

cavity in each ornament suggests. Threaded support rods had been installed to mount the ornaments securely into the side arms of the desk.

The desk was originally designed and constructed to function with electric candles. Since Brockville was one of the first cities in Canada to be electrified, it was fitting to return the candles to electrical operation. As a safety precaution, the original wiring was retained but disconnected. New wires were routed beside the original to operate 12 volt lamps.

The leather writing surface of the desk is decorated with a border of gold tooling in a floral pattern.

The clock in the desk bore the marks of a Parisian maker. This is an indication, along with the traditional European craftsmanship and joinery, that the desk was made in France and was later brought to Canada. The date of the clock movement, 1900, as well as the presence of the wiring, suggest that the desk was constructed around the turn of the century in the style of Louis XV.



**Figure 3.** Ormolu side angel.

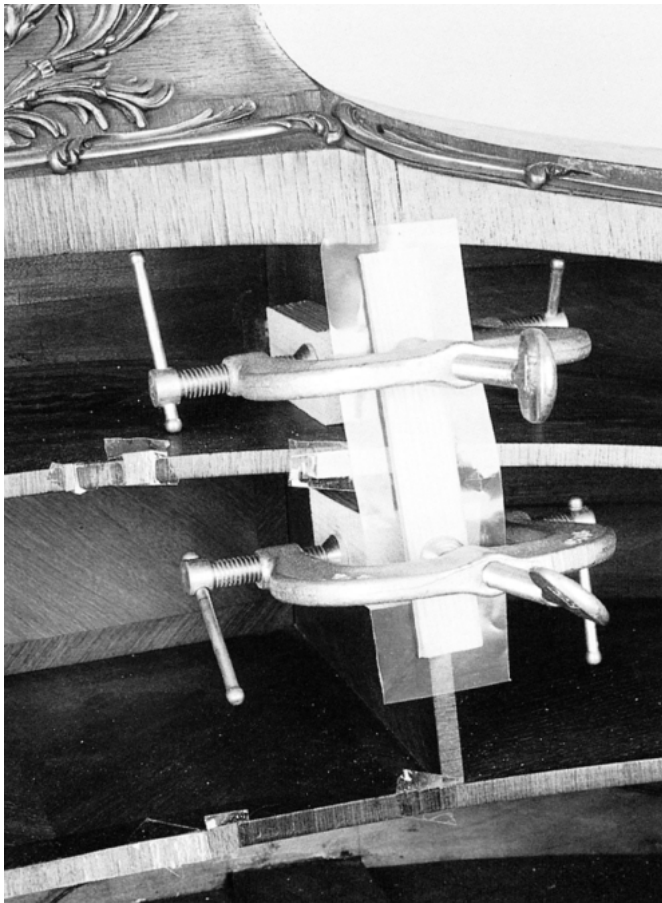
### Veneer Damage

Veneer problems, such as lifting or separation, occur most frequently as a result of humidity fluctuations. High humidity causes the adhesive between the veneer and the carcass to soften, whereas low humidity will dry it out. In addition, as moisture is being taken in and given off, varying rates of expansion and contraction of the individual wood species create differential movements in the carcass that can cause veneer to separate or lift. The pine carcass of the desk may move in one direction, but the grain orientation of the veneer may be aligned in a different direction to the carcass, resulting in the separation of the two layers.

### Veneer Repair

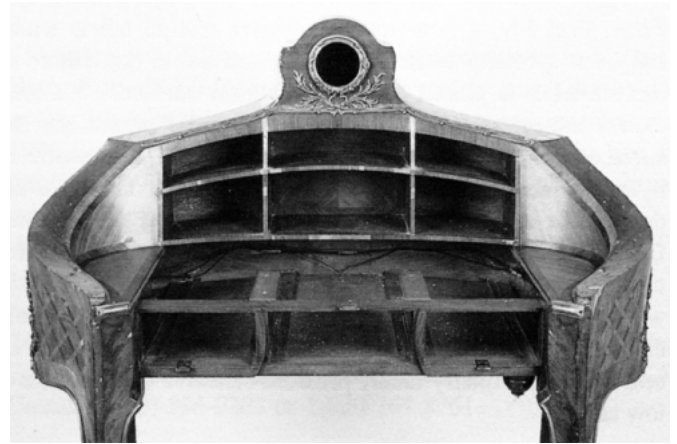
Rosewood replacement pieces were cut and fitted into the gaps of missing veneer sections, and then temporarily secured to the adjacent, original veneer using low-tack film tape. The small, enclosed drawer space in the pigeon holes of the desk top required a clamping system that would ensure consistently

distributed clamping pressure against the front edge of the frame. A concave, padded clamping block, matching the shape of the front edge, was fitted and then placed between the clamp and the replacement veneer. The clamping system was applied as a trial and when deemed to be satisfactory, the system was removed, Lee Valley High Tack Fish Glue applied, and the system set back into place. After the clamping had been completed, the new veneer was sanded, inpainted, and finished (**Figure 4**).



**Figure 4.** Clamping jig on drawer front.

The clamping problem becomes more complex and challenging when an object such as this desk has many compound curves and large flat areas (**Figure 5**). Some of these surfaces are difficult or impossible to reach with ordinary mechanical clamps, and require custom designed clamping blocks which are very time-consuming and labour intensive to construct. In some cases, alternate methods of clamping can be devised by using other support materials, such as sandbags. Low-tack film was often applied, securing a brittle veneer surface, and preventing further tearing while working on an area. Adhesive was injected under the veneer and the small compound curves were clamped using heated sandbags, which conform to this type of surface without difficulty. After clamping, the replaced veneer was sanded, inpainted, and finally finished.

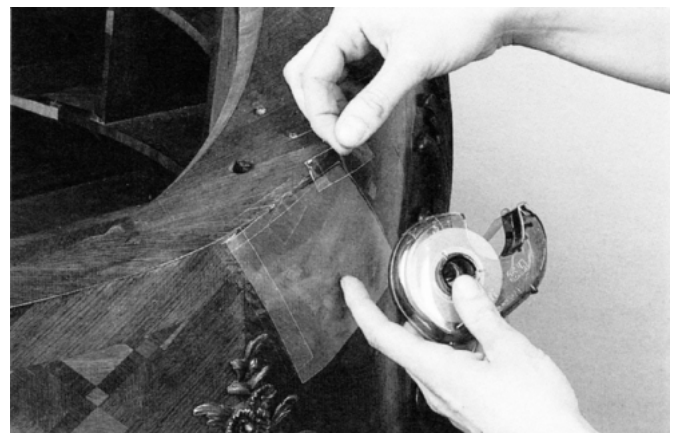


**Figure 5.** Desk stripped of ornament illustrating series of compound curves.

Sandbags may be used to provide pressure during the re-attaching of veneer to small, compound curves, but they are not feasible for use on large, flat surfaces which cannot be reached with ordinary, mechanical clamps. In this case, a clamping system based on a vacuum can be used to re-attach veneer to its substrate.

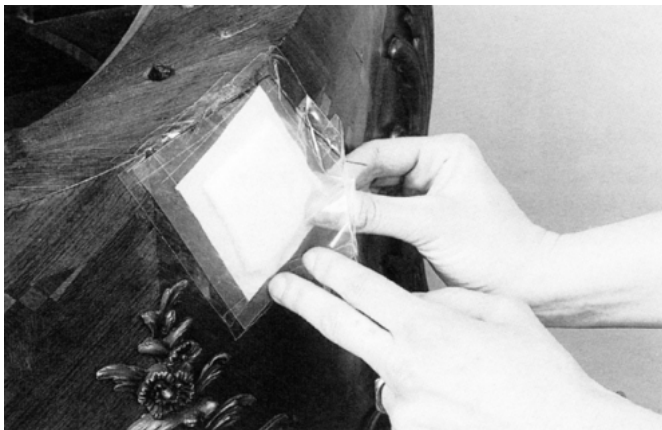
#### **Vacuum Bagging and Application**

Vacuum bagging is a method that uses atmospheric pressure to clamp adhesive-coated components in place until the adhesive cures. The idea itself is not new and has been used for decades in the boat building and aircraft industries, but its potential use by conservators has not been fully realized. To use the vacuum method, the veneer to be re-adhered is softened with moisture and aligned, adhesive is injected under it, and then the veneer is covered with an airtight, transparent film. Commercially available polyethylene or vinyl sheeting is cut to a size slightly larger than the damaged section, and secured using low-tack film tape, which must be tested to ensure that it does not disturb the finish (**Figure 6**).



**Figure 6.** Polyethylene sheeting attached with low-tack tape.

Two materials are inserted into the vacuum envelope. First, Peel Ply, a non-woven polyester release fabric which has been specially treated so that adhesives do not adhere to the material, is placed against the veneer surface. It allows excess adhesive to wick through and to be peeled off the surface after the adhesive has cured. Secondly, a non-woven, nylon automotive light duty cleaning pad, that has been cut down to fit into the envelope, is placed on top of the polyester fabric (**Figure 7**). The pad, similar to a pot scrubber used for cleaning but without abrasives, acts as a manifold through which air from all areas within the envelope can be evenly channelled to the vacuum nozzle. The envelope can then be sealed using ordinary clear, pressure-sensitive tape that has a low tack.



**Figure 7.** Inserting Peel Ply and light duty cleaning pad.

Establishing a seal between the envelope and the vacuum source can be problematic. The simplest method is to attach a common window suction cup to the end of a Tygon tube, to act as the vacuum nozzle. A hole cut through the centre of the suction cup allows air to flow through the cup and the tubing to the vacuum pump. A small x-shaped incision is made in the surface of the envelope and is then covered by the suction cup (**Figure 8**).



**Figure 8.** Cut opening with suction cup and tubing.

As the vacuum is turned on, it draws out all air from inside the envelope (**Figure 9**). The pressure within the envelope drops, while the pressure outside the envelope remains the same, and presses the polyethylene sheet, the nylon pad, and the Peel Ply against the substrate, distributing even, overall pressure.



**Figure 9.** Assembly completed and vacuum applied.

A gauge is used to display the amount of vacuum that is drawn. A range of 68 to 91 kPa has been found to be acceptable for veneer repair (*i.e.*, almost up to maximum vacuum which is 101 kPa). The vacuum clamp remains in place until the adhesive has cured. Experience shows that the drying of water-based glues under vacuum is not a practical problem due to adsorption of moisture by the wooden carcass and air leakage through the system. Due to safety considerations, overnight vacuum clamping is not recommended.

This process can develop a pressure of up to 101 kPa, but contrary to many clamping systems, the force is evenly distributed over the entire surface under vacuum. For example, an area of approximately 10 cm x 10 cm clamped at 95 kPa will sustain a total clamping force of 950 N. An area covered with padded weights that are often used by conservators may sustain only approximately 40 N of clamping force.

If the veneer slips out of position during the vacuum clamping process, it can easily be seen through the transparent envelope. The vacuum can be turned off and the pieces re-aligned, often by manipulating through the envelope. When alignment is correct, the vacuum is re-established and the adhesive is allowed to cure.

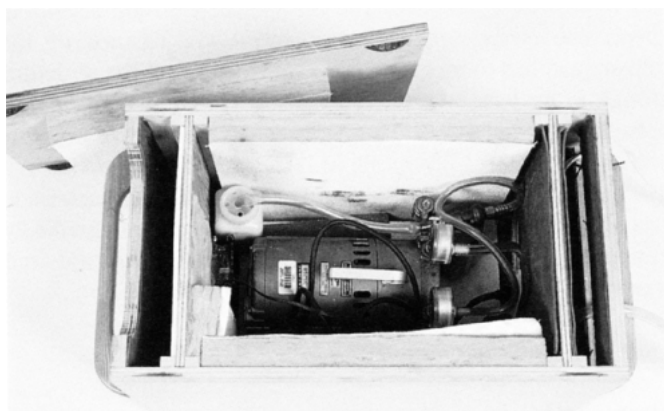


## Equipment Required

The equipment needed for a vacuum clamping system is minimal. Vacuum pumps are mechanically similar to air compressors, but work in reverse, by drawing air from the closed system, and exhausting it into the atmosphere.

Tygon tubing leads up from the pump, and is split, using a T-fitting. One tube is passed to the vacuum gauge, the other is attached to the suction cup that is fixed to the airtight membrane. Since the vacuum gauge is awkward to position, it can be held using a clamp and attached to any type of tripod. On a large repair, the gauge can be attached to a suction cup and used to read the vacuum directly on the plastic membrane.

Working with a running pump can be extremely noisy. In an effort to reduce this noise, a sound absorbing enclosure can be constructed, into which the pump is placed (**Figure 10**). A built-in fan cools the pump while in operation and diverts the exhausted air out through a slot on the side. This reduces the sound level generated by the pump, in this case, from 84 db to 68 db.



**Figure 10.** Vacuum pump with noise reduction enclosure.

## Conclusion

Vacuum clamping to treat the damaged parquetry offers many advantages over mechanical clamping. It provides an evenly distributed pressure, allows control of excess adhesive, and reduces failures in alignment. In other words, it constitutes a simpler method to use on large, flat or curved surfaces.

The materials required for this process are minimal and greatly facilitate otherwise difficult clamping procedures. Further experimentation can make this process applicable in solving other conservation problems, such as in the repair of skin and leather artifacts.

## Acknowledgements

The author would like to express her special thanks to Michael Harrington of CCI for his suggestions and feedback during the conservation of this desk and the subsequent talk given at the 1996 CAC conference in Montreal. She would also like to thank Carl Bigras of CCI for the production of the visual material.

## Materials and Equipment

Lee Valley High Tack Fish Glue: available from Lee Valley Tools Ltd., 1080 Morrison Drive, Ottawa ON K2H 8K7, Canada, (613) 596-9202 or 1-800-267-8761.

Light duty cleaning pads: available from the Norton Company (# 58001), Worcester, MA 01615-0008, USA, or from 3M Canada (Scotch-Brite 7445), London ON N6A 4T1, Canada.

Low-tack film tape: available at most stationery stores.

Peel Ply: available from West System Epoxy, Gougeon Brothers, Inc., USA; available in Canada from Plastics of Ottawa, 216 Pretoria Ave., Ottawa ON K1S 1X2, Canada, (613) 235-1465.

Polyethylene sheeting (vapour barrier): available at any hardware store.

Surgical tubing and T-shaped connector fittings: available from Canadawide Scientific, 2300 Walkley Road, Ottawa ON K1G 6B1, Canada, (613) 736-8811 or 1-800-267-2362.

Vacuum pumps and accessories: available from the Gast Manufacturing Corporation, USA, and imported by Wainbee, 1590 Liverpool Court, Ottawa ON K1B 4L2, Canada, (613) 744-1720.

Window suction cups: available at houseware or department stores.

## Notes

1. Kate Helwig, of the Analytical Research Laboratory at CCI, identified the substrate of the metal ornament as brass, and found it to be gilded, probably by an electroplating process. A brown patina on the metal ornaments was found to be a pigmented, natural resin.

\* *This paper was presented at the 1996 Annual Conference of the Canadian Association for Conservation of Cultural Property in Montreal. The desk was treated in the preceding year by the author while a conservation fellow at the Canadian Conservation Institute in Ottawa.*