SAMANTHA SHEESLEY

Vortices and Reveries: An Innovative Treatment of Oversized Three-Dimensional Paper Objects

ABSTRACT

Vortices and Reveries, by Karen Stahlecker, is a mixed-media installation composed of nine black conical forms and nine white tree-like forms in the collection of the Smithsonian American Art Museum. Each piece measures nearly twelve feet in height and three feet in diameter. Each was made from handmade and dyed kozo paper, steel hoops, silver wire, wooden dowels, Velcro® and hot melt glue.

Unfortunate mishaps caused by the artist's choice of materials have resulted in damages to the delicate paper elements. Without conservation intervention, the rusted steel armatures, work-hardened silver wire, tenacious Velcro® and hot-melt glue would have undoubtedly contributed to future damages and deterioration of the objects.

The nine conical forms were treated in the Smithsonian's Lunder Conservation Center. Conversations with Stahlecker provided important details about her aesthetics, materials and processes. The damaged objects were thoroughly documented and mock-ups were used to test steps in the treatment proposals. A two step solvent-reactivated adhesive system was developed for reversible mending and the Velcro® used to secure the nine paper cones was replaced with a magnetic system. Due to concerns voiced by the artist, the steel hoops were cleaned and coated rather than being replaced with hoops made from a less corrosive material.

INTRODUCTION

Vortices and Reveries is a multimedia installation which originally consisted of handmade and dyed kozo paper and kozo fibers, steel, silver wire, wooden dowels, Velcro® and hot melt glue. Eighteen objects comprise the installation, each measuring nearly twelve feet in height. There are nine white tree-like forms and nine black conical forms. Each form was suspended from the ceiling with silver wire and supported

Figs. 1–2. Karen Stahlecker, *Vortices and Reveries*, 1993. Dyed paper, dyed kozo fibers, steel hoops, silver wire, wooden dowels, Velcro, hot melt glue. Each object measures 11'9" in height, 35" diameter, Smithsonian American Art Museum, Renwick Gallery (2006.39.1–18)

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from below by sized kozo stalks. The combination and complexity of the materials allowed for exploration and application of inventive techniques to paper conservation. This project also provided an opportunity to collaborate with paper and objects conservators, curators, registrars, exhibition specialists, collection managers, conservation scientists and the artist (figs. 1–2).

The focus of this treatment centered on the mending and stabilization of the nine black conical forms. The black cones had sustained more extensive and severe damages than the white tree forms. This can be attributed to two main reasons. Despite consistencies in raw material, preparation and technique, the white sheets were more robust than their diaphanous black counterparts. In addition, more Velcro® had been adhered to the black cones. As described below, the superfluous use of tenacious Velcro® resulted in damages to the forms during handling, installation and de-installation. Due to time constraints, prioritization had been given to the conservation treatment of the black conical forms, with the hope that the white tree forms will be revisited and considered for similar examination, documentation, treatment and storage.

THE CREATION OF *VORTICES AND REVERIES*: STAHLECKER'S MATERIALS AND TECHNIQUES

One of the most interesting and rewarding aspects to dealing with contemporary art is the communication with the artist. To better understand the materials and processes used to create *Vortices and Reveries*, and to ensure diligent conservation practice, the artist, Karen Stahlecker, was contacted. When asked, Stahlecker enthusiastically supplied the details concerning the manufacture of her forms.

She fabricated her paper sheets, structural ribs and stem-like bases from Thai kozo fibers. The kozo fibers were cooked in lye and hand beaten. To attain a deep, rich black, the black fibers were colored using a two-step process. First, a Procion dye was applied to the slurry. Afterwards additional black pigment was mixed in the vat with a cationic retention aid. Stahlecker used large Tyvek® sheets dammed with plastic as papermaker's moulds. The slurry was poured onto these Tyvek® moulds and then sprayed with a garden hose to produce a network of holes, creating a lace-like paper similar to Japanese amime papers (Stahlecker 2007) (fig. 3).

To retain rigidity, fibers used for structural elements, such as the red ribs and stems, were cooked and beaten to a lesser degree than those used for the diaphanous paper sheets. They were colored with cadmium pigments and sized with methyl cellulose. The red ribs were then arranged on the freshly formed black paper sheets and pressed into contact just before the paper was dried. Once the red ribs were adhered to the black paper sheet, they served as integrated structural supports which upheld the cone's form.

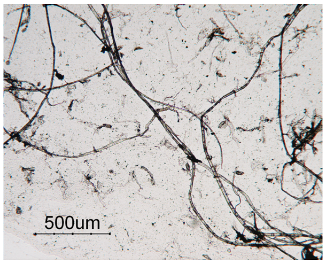
Fig. 3. One of Stahlecker's handmade paper panels from *Vortices and Reveries*. Smithsonian American Art Museum, Lunder Conservation Center

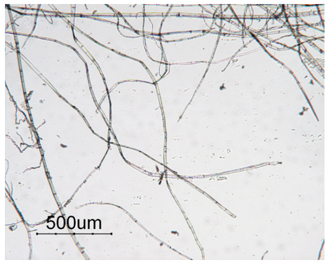
Fiber samples were taken from the black paper panels and the red ribs to confirm the artist's materials for purposes of documentation. Working under the supervision of the Smithsonian Museum Conservation Institute, images of the samples were captured through a polarizing light microscope and compared to known references. As seen in these photomicrographs, Stahlecker indeed used kozo fibers for her paper panels and structural ribs. Although both red and black fibers are from the same Thai kozo source, note the difference in size between the two. This is attributed to the differences in their preparation (figs. 4–7).

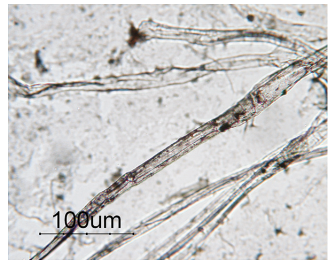
Stahlecker adhered Velcro® swatches along the edges of each panel with hot melt glue to hold the panels together as a cone. All of the Velcro® swatches were applied at irregular intervals, which mandated careful planning to ensure proper configuration of the paper cones. Once in cone formation, each paper form was aligned with the artist's registration marks and secured to its steel hoop with Velcro®. The artist's registration mark was located on along the top of panel A and carefully aligned with the mark painted on its respective steel hoop. Again, the Velcro® swatches were adhered erratically. Therefore coordination between handlers was crucial to ensure proper alignment and attachment of the cone to its hoop without damaging the six foot tall paper form.

The steel hoops uphold the cone's form and accept the silver wire which suspends each cone from the ceiling. The steel hoop armatures were actively rusting. This rust would inevitably transfer to the paper elements and contribute to the discoloration and degradation of the paper supports over time (fig. 8).

The fine silver wire was selected by the artist because it was less visually distracting than a more substantial stainless







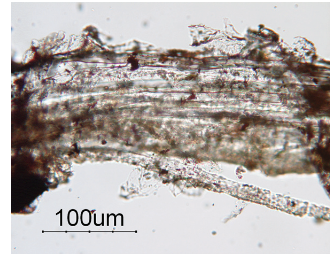


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Fig. 4. Black fiber sample from *Vortices and Reveries* through polarizing light microscope, Museum Conservation Institute (2006.39.4)

Fig. 5. Kozo fiber reference sample through polarizing light microscope, Museum Conservation Institute

Fig. 6. Black fiber sample from *Vortices and Reveries* through polarizing light microscope, Museum Conservation Institute (2006.39.4)

Fig. 7. Red fiber sample from *Vortices and Reveries* through polarizing light microscope, Museum Conservation Institute (2006.39.4)

Fig. 8. Detail of paper panels fit around steel hoop while suspended from ceiling in Renwick Gallery, Smithsonian American Art Museum (2006.39.7–8)

steel wire. Unfortunately, the soft silver wire was work-hardened through manipulation during installation. The work-hardened wire failed during the exhibition, resulting in damages to the paper elements after two of the black cones fell. This unfortunate accident made conservation intervention a priority for *Vortices and Reveries.*

INSTALLATION

The piece had been installed at the Renwick Gallery by Renwick and American Art Museum staff with the assistance of the artist. Stahlecker had a system in which she utilized circular templates to mark the placement of each object within a desirable proximity to the others. She also devised and utilized a movable support beam for the assembly and installation of the black paper cones. A steel hoop was suspended from a hook on an overhead support beam so each paper cone could be secured to its hoop with Velcro®. Fortunately for Renwick and American Art staff, Stahlecker had supplied thorough written instructions for installation and de-installation of the objects. Furthermore, the installation at the Renwick was well documented with photographs and videos. Review of the artist's instructions, museum documentation and careful examination of the installed pieces was beneficial when faced with de-installation and disassembly of the forms without the artist's presence. Further insight was gained into the construction and connection mechanisms through the examination of a disassembled piece, which had fallen and was subsequently dismantled and stored in an office (fig. 9).

Despite the wealth of information provided by the various notes, photographs and videos, de-installation of the objects was convoluted. A team of five to seven people were required to safely and efficiently handle each of the components. The tight gallery space urged orchestration and organization throughout the task. As each of the eighteen objects was dismantled, the necessity for conservation intervention became apparent.

The delicacy of the objects was emphasized by the numerous tears and repair campaigns. The precariousness of the installation was illustrated by the failure of some of the artist's materials. The curator of the Renwick's collection clarified her treatment goals: stabilization was first and foremost. As the new custodian of *Vortices and Reveries*, she hoped that a simplified installation procedure would prevent new damages during installations and exhibitions. The improved installation system could eliminate confusion caused by misinterpretation of complex instructions previously supplied by the artist. Such improvements would also permit the work to travel to other venues for exhibition.

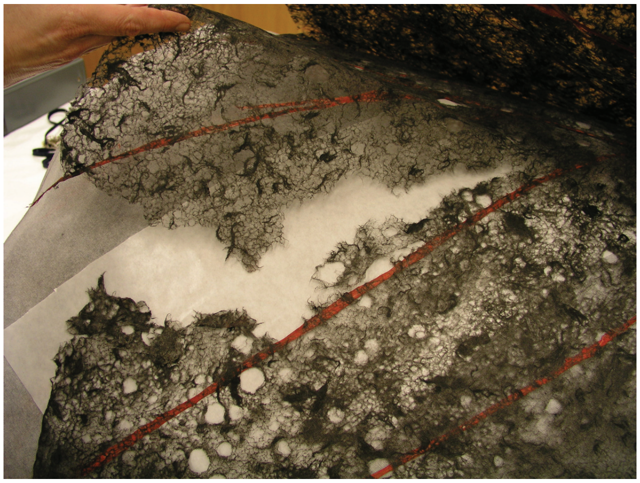


Fig. 9. Detail of damage to paper panel after deinstallation of *Vortices and Reveries* (2006.39.1)

Fig. 10. Detail of artist's label, Smithsonian American Art Museum (2006.39.5)

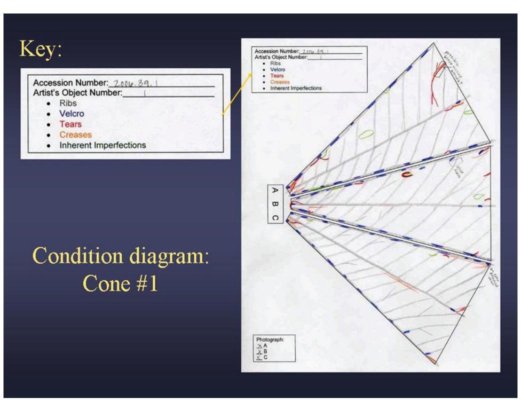
LABELING AND DOCUMENTATION

Each panel was labeled by the artist with an object number (1 through 9) and the panel letter (A, B, and C). Per the artist's instructions, the panels were placed on a contoured support in reverse order, laying piece C first, followed by B, and finally A. A temporary storage container was constructed around the supports for safe transport of the black paper panels to the conservation lab for examination and repair (fig. 10).

Documentation and organization was a challenging component to this project. There are nine black cones, each of which are made up of three paper panels, totaling twenty-seven paper pieces in need of examination, documentation and treatment. Each panel measures seventy-three inches in length, thirty-nine inches in width at the top edge, and two inches at the bottom. Each panel incurred multiple damages. Neither written nor photographic documentation alone could clearly convey the condition of these pieces.

Documentation began with the creation of templates for condition diagrams. Each page represents one full cone. There are 9 pages, illustrating three panels on each page. Each diagramed panel was labeled A, B and C, corresponding with the artist's labels. Each page provided space for the Smithsonian American Art Museum's accession number and the corresponding artist's label. A color-coded key differentiated structures and damages found within each diagramed panel. Grey lines represented the red structural ribs found in each panel, blue dashes identified Velcro® swatches, red marks indicated tears, orange illustrated creases and green represented inherent qualities which may be misinterpreted as damages (fig. 11).

It was important to locate and qualify damages and differentiate them from voids in the paper sheets which were inherent products of the artist's paper formation process. These diagrams clearly denoted the location and extent of damages. These visuals corroborated theories which correlated damages to the use of certain materials, such as Velcro®. Tears



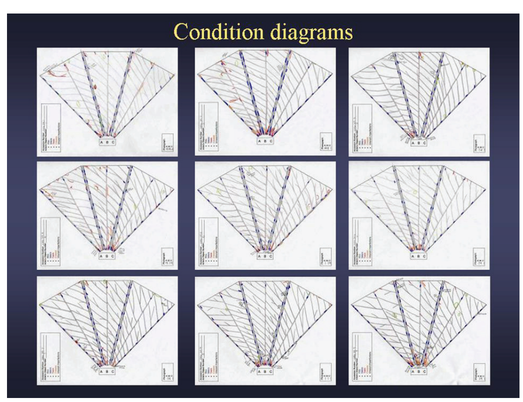


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Fig. 11. Diagram used for condition reports with color coded key

Fig. 12. Nine color coded diagrams used for condition reports of nine black paper cones

along the bottom edge of the paper panels related to where the paper attached to its respective Velcro®-lined dowel. Similar tears and creases were seen throughout all twenty-seven paper panels (fig. 12).

Unfortunately, the panels were not completely flat and when illuminated on a slantboard, gaps between the paper supports and the board created multiple shadows. The optical effects resulted in blurry images. Shadows were eliminated by photographing the panels on an arched support that was fabricated from acid-free corrugated blue boards. To maintain consistency in documentation, the photographs, like the diagram templates, were printed three-to-a-page, with each of the nine pages illustrating a single cone. To better identify damages and repairs, details were also photographed before and after treatment (figs. 13–14).

Fig. 13. Arched support used for photodocumentation of paper panels

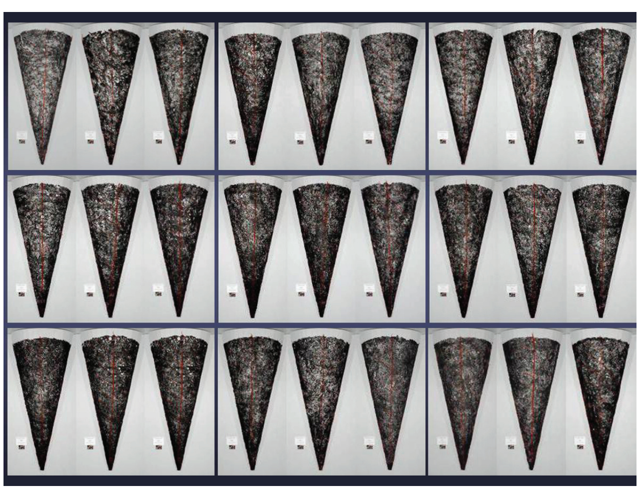


Fig. 14. Before treatment photographs of all 27 panels comprising the 9 black paper cones in *Vortices and Reveries*, Smithsonian American Art Museum, Lunder Conservation Center (2006.39.1–9)

MENDING *VORTICES AND REVERIES*

Fortunately Stahlecker is an artist who was selective of her materials and is concerned with the preservation of her work. When the installation was accessioned into the American Art Museum's collection, she was certain to include additional pieces of paper made from the same slurry in the same manner as that used to make *Vortices and Reveries*. These paper pieces proved invaluable during testing throughout the treatment. In preparation for mending, the solubility of the paper colorants was tested. They were sensitive to water but stable in ethanol. Therefore, a non-aqueous adhesive was sought for mending. Both Klucel G and Lascaux 498 HV have been employed by paper conservators, and have proven to be stable over time.

Klucel G can be mixed with a number of solvents including ethanol. It can also be reversed with Ethanol. Lascaux 498 HV is a dispersion which is soluble and reversible in a number of solvents including ethanol, and is also thermoplastic. Therefore, it can be set with heat and reactivated with either ethanol or heat.

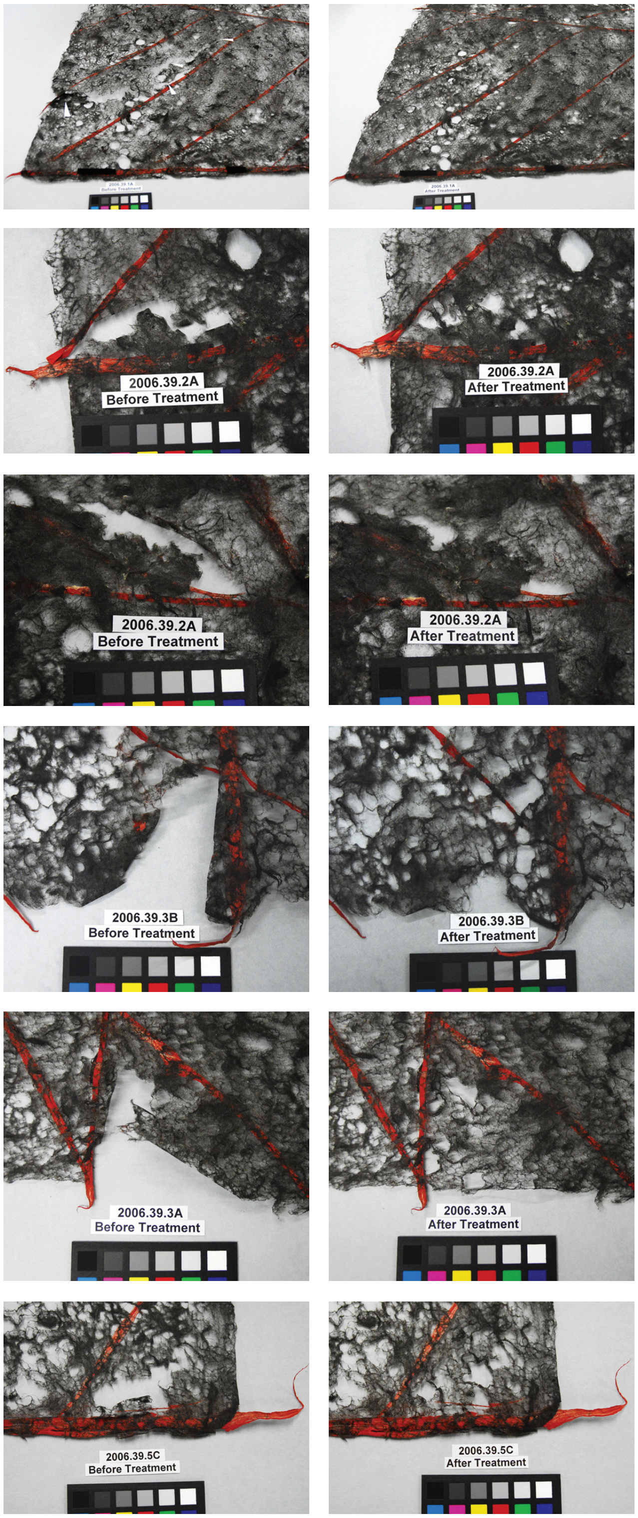
The tears were face-mended with a 10% solution of Klucel G in ethanol and the repairs were reinforced with a solvent-reactivated mending tissue (Anderson and Puglia 2003). Lascaux 498 HV was selected as the re-activated adhesive. With this system, the reinforcing tissue could be removed with heat without disturbing the face mends. Conversely, if desired, both mending campaigns could be removed simultaneously with ethanol.

Due to the delicacy of the artist's paper, tengujo was selected to serve as the carrier for the reactivated mending tissue. It was toned with carbon black Golden® fluid acrylic paint. Lascaux 498 HV was brush-applied to the toned tengujo over silicon release Mylar. Once dry, a small section of the Lascaux-coated tissue was reactivated with drops of ethanol and adhesive-coated fibers were teased from the sheet with fine tweezers. The Lascaux-coated fibers reinforced the Klucel G face mends by bridging the broken support fibers.

This mending method was ethically favorable for its stability and reversibility while being practically favorable for its ease and speed. Because the mending materials appeared sympathetic to the original, the mends were also aesthetically favorable as they were visually unobtrusive. Detail photographs were taken to clearly document damages to the paper support before and after repair. With the aid of documentation and proper lighting, a trained eye will be able to identify the repairs so that future custodians will be able to differentiate the conservation treatment from the artist's work (figs. 15–20).

DETAIL OF DAMAGE

BEFORE AFTER



TOP TO BOTTOM IN SETS OF TWO

Figs. 15–20. Detail of damage. Smithsonian American Art Museum, Lunder Conservation Center

THE DECISION TO TREAT THE ORIGINAL STEEL HOOPS

Throughout any treatment, a balance must be maintained between the preservation of the physical object and the artist's intent. In this instance, materials purposefully selected by Stahlecker for their aesthetic qualities have resulted in damages to the art objects and would undoubtedly propagate new damages and deterioration. In order to preserve these objects and prevent damage during handling, installations, exhibitions and storage, it was proposed to clean and alter the steel hoops, and replace the silver wire and Velcro® in addition to mending the torn paper elements.

Replacement of the steel hoops with a less corrosive material could have prevented the transfer of rust to the paper elements. An improved design may have facilitated safer handling and fewer complications during installation. However, Stahlecker had reservations concerning the replacement of the hoops. Because the artist is guaranteed certain moral rights, her concerns cannot and should not be disregarded (Broderson and Goetzl 1991). She hoped to preserve the original steel hoops regardless of their corrosive nature. Despite reassurances that we could replicate the shape of the originals, she felt that the original hoops were integral to the aesthetic and conceptual integrity of the objects. According to Stahlecker, the production of *Vortices and Reveries* began with the fabrication of these steel hoops and the paper panels were successively made to fit these hoops. The artist feared that her engineering would be lost to replacements and that the fit could not be exacted. Therefore, cleaning and coating alternatives were researched.

Because powder coating is a more durable metal coating than conventional paint, it would effectively seal the steel hoops and prevent rust from transferring to the paper elements (Pennisi 2007). Preparation was required before the hoops could be sent for coating (AFI Powder Coating, Inc. 2007). The hoops would be placed in an oven reaching temperatures of 900ºF. All existing coatings, including rust, hot melt glue, Velcro®, silver wire and paint would be burned off in the cleaning process. This included all labels and registration marks applied by the artist. To maintain each hoop's identity and proper alignment with its respective paper panels, numerical steel punches were used. Each hoop is now impressed with its number and each impression was made at one of the artist's original registration marks.

REMOVING AND REPLACE THE VELCRO®

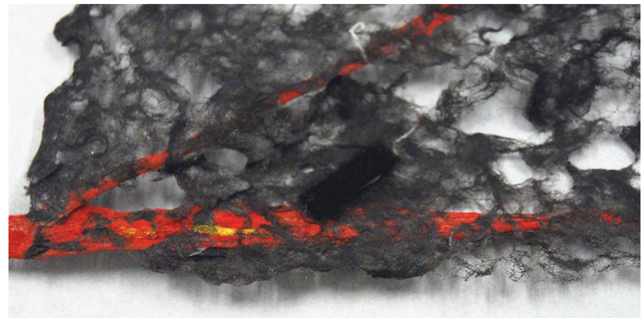
The excessive application and extreme tenacity of the Velcro® resulted in numerous tears to the paper supports. Since the bond between the paper fibers was weaker than that between the Velcro® pieces, the paper was frequently damaged during separation of the Velcro®. Stahlecker selected the Velcro® and hot melt glue as a practical attachment system. It was not intrinsically linked to the artist's aesthetic and therefore she had no reservations concerning its replacement. While some hot melt adhesives may be acceptable for storage enclosures, they should not be applied directly to an art object. Hot melt glues are generally inflexible, can yellow and become brittle over time.

The removal of hot melt glue and Velcro® from one of the wood dowels was tested. Several drops of toluene were applied along the Velcro®-dowel interface. The Velcro® was then separated from the hot melt glue surface with a microspatula. The glue did not dissolve but rather swelled and softened when saturated with toluene. A second application of toluene was applied to the glue and the spatula was used to separate the hot melt from the dowel.

Because the Velcro® and hot melt glue released from the dowel readily, a similar test was performed on a Velcro® swatch adhered to one of the red kozo ribs. Again the Velcro® released from the hot melt glue surface with the first application of toluene and the second solvent application reduced the hot melt glue with the aid of the spatula.

To ensure adequate softening of the hot melt glue on the delicate black paper fibers, a solvent chamber was used to increase the adhesive's exposure time to the toluene. After fifteen minutes, the Velcro® peeled away from the hot melt glue with ease, exposing the adhesive layer. With careful manipulation, the hot melt glue was rolled back at a low angle to the paper, and peeled away in a single piece leaving little residue and no damage to the paper fibers. Because the Velcro® and hot melt glue was successfully removed from the object's surface, the Velcro® could be replaced with a magnetic system (figs. 21a–e).

A product known as Magically Magnetic Paint (Magically Magnetic, Inc. 2007) was selected for the new attachment system. This concentrated powder additive contains microscopic metallic particles which are attractive to magnets. Any surface or material coated with paint containing this product then becomes attractive to magnets. Sekishu was selected and toned with carbon black Golden® fluid acrylic paint. The toned





PICTURED RIGHT, TOP TO BOTTOM

Fig. 21a. Detail of Velcro® adhered to paper support with hot melt glue (2006.39.9)

Fig. 21b. Detail of toluene solvent chamber used to soften hot melt adhesive (2006.39.9)

Fig. 21c. Separation of Velcro® from hot melt adhesive with micro spatula (2006.39.9)

Fig. 21d. Separation of hot melt adhesive from paper support with microspatula (2006.39.9)

Fig. 21e. Detail of paper support after removal Velcro® and hot melt adhesive (2006.39.9)

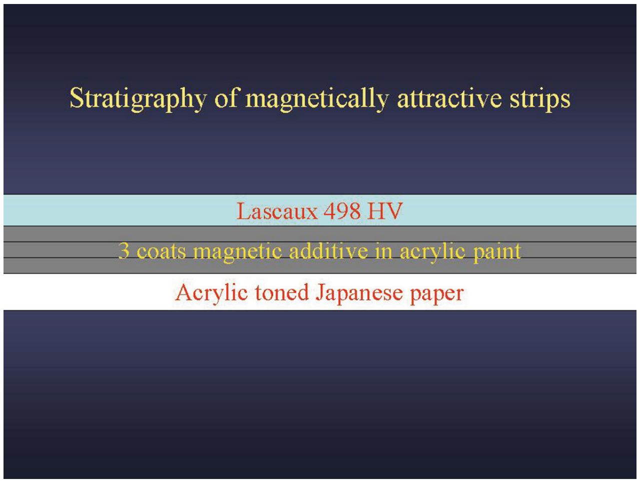


Fig. 22. Diagram of stratigraphy of magnetic coated paper strips

paper then received three coats of Magically Magnetic Paint additive mixed with carbon black Golden® fluid acrylic paint. Once dry, Lascaux 498 HV was applied over the metallic paint layer. The Lascaux worked as a reversible thermoplastic adhesive while serving as an isolating layer between the Magically Magnetic strips and the surface of the artwork (fig. 22).

Twelve small Magically Magnetic strips, each measuring ¼" x ¾", were attached at regular intervals along each edge of the black paper panels with a heated spatula. During an exhibition, one small neodymium rare earth magnet was inserted between two overlapping metallic strips on adjoining panels. These tiny magnets measure ¼" x ⅛" x 1/32" and were strong enough to hold the paper panels together in cone formation. Attraction and repulsion forces between magnets of overlaying panels were not an issue since the magnets were completely removed from the paper panels and housed separately for storage purposes.

A NEW ATTACHMENT SYSTEM

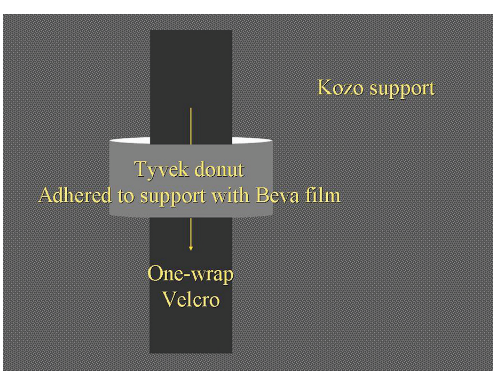
Because the hot melt glue and Velcro® had been removed from the paper panels and the steel hoops, a new attachment method was needed to secure the paper cones to their steel hoops. A more user-friendly system was desired, especially considering that the artist would not be present during future installations to interpret complicated diagrams and instructions.

Tyvek® donuts were made and toned with carbon black Golden® fluid acrylic paint. They were then adhered to the tops of the red ribs of each paper panel with Beva® film. During installation, One-Wrap® Velcro® was threaded through the Tyvek® donuts, wrapped around the powder-coated steel hoops and attached to itself. One-Wrap® Velcro® is commonly used to wrap electronic cables and has hooks on one side and loops on the other. Therefore, it requires no adhesive and attaches to itself. With this system, there are no static attachment points between the paper cones and the steel hoops. The paper panels can be shifted on the hoop if necessary. The arduous task of aligning the paper panels and hoops in accordance to obscure registration marks was diminished. Like the magnets, the Velcro® can be completely removed from the objects during storage (figs. 23a–b).

To prevent future damages arising from the failure of the silver wire, the original was replaced with a nylon-coated stainless steel wire. The steel provides the strength necessary to suspend the cone without fear of failure, while the nylon coating offers a soft buffer between the stainless steel wire and the newly powder coated hoops. The selection of a stainless steel wire similar in gauge to the original silver wire maintained Stahlecker's aesthetic.

TEST INSTALLATION AND LONG-TERM STORAGE

The material replacements and installation mechanisms were tested during a temporary installation in the Smithsonian American Art Museum's Lincoln Gallery. The magnets proved strong enough to hold the paper pieces in cone formation. The powder coated hoops appeared as the artist had originally made them. The nylon coated steel wire was no more distracting than the artist's silver wire. The simplified system relied on two to three handlers to install each form, as opposed to the previously required five.



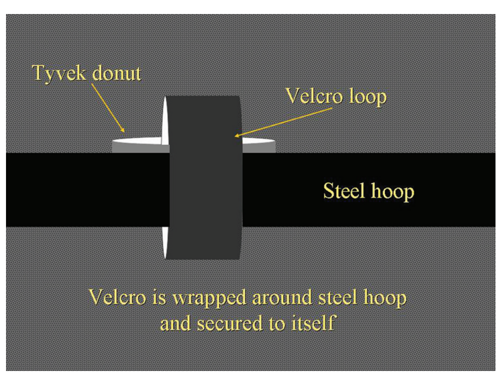


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Fig. 23a. Diagram of Tyvek® donut (adhered to paper support) and One-wrap Velcro®

Fig. 23b. Diagram of One-wrap Velcro® securing paper support to steel hoop

In addition to material tests, the temporary installation gave me an opportunity to participate in the Lunder Conservation Center's public outreach efforts by speaking about conservation and this particular project with museum visitors and staff. Although technical questions were asked and answered, the majority of the gallery talk focused on the ethical considerations given to multi-media, contemporary works of art. Artist intent and moral rights were addressed in addition to decisions regarding the replacement of certain components as opposed to their repair (fig. 24).

Once the object was de-installed from the gallery, the objects were prepared for storage. New enclosures were engineered for long-term storage. An arched support was fabricated from acid-free corrugated blue board to hold all twenty-seven black paper panels with glassine interleaves. Three separate containers were constructed from corrugated plastic sheets to hold each group of components: the supported paper panels, the powder coated hoops, and the kozo stalks. The corrugated plastic sheets will protect the objects from water, while minimizing the weight of the package. Diagrams, notes and material lists have been included in the Smithsonian American Art Museum's permanent file for future review. These designs can be modified to fit the white tree-like forms so as to properly house and preserve the other half of *Vortices and Reveries* (fig. 25).

CONCLUSION

Due to the comprehensive and complex nature of this installation and its treatment, collaboration among numerous departments and individuals in the Smithsonian American Art Museum and outside was essential to the success of this project. The damaged paper elements have been repaired and restored to their original appearance. The removal of tenacious Velcro® will prevent mechanical damages during future installations. The replacement of Velcro® with a magnetic attachment system proved strong enough to hold the paper pieces in cone formation. The simplified system required two to three handlers to install each form, as opposed to the previously required five. The powder coated hoops maintain the artist's original aesthetic, but will prevent the transfer of rust to the paper elements. The nylon coated steel wire was no more visually distracting than the artist's silver wire, and the increased strength will prevent future failure during exhibition. This multifaceted and innovative treatment would not have been possible without the enthusiasm, diligence, cooperation and support of the artist, Karen Stahlecker, the Renwick Gallery, the Smithsonian American Art Museum and the Lunder Conservation Center.

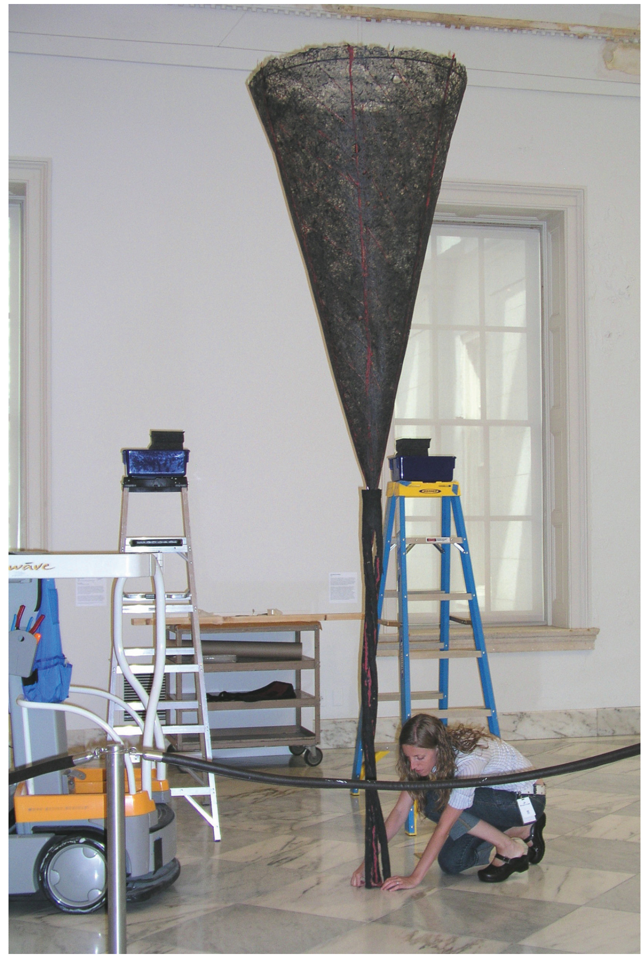

Fig. 24. Test installation in Smithsonian American Art Museum's Lincoln Gallery (2006.39.4)

Fig. 25. Archival support fabricated for long term storage of paper panels, Smithsonian American Art Museum, Lunder Conservation Center

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SAMANTHA SHEESLEY
Paper Conservator
Conservation Center for Art and Historic Artifacts
Philadelphia, Pennsylvania
samsheesley@hotmail.com