

The Shrink Wrap Project at Rutgers University

Special Collections and Archives

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From January 1 through late July of 1992, I was hired by Rutgers University Special Collections and Archives to fill in for their Preservationist, who was pursuing a six month internship elsewhere. The job involved routine preservation activities, such as re-housing and minor repair for a collection of 30,000 rare books and 100,000 volumes in total. The collections were located in Alexander Library, on Rutgers' College Avenue campus. When I arrived, two buildings on campus were in the preliminary stages of a major renovation and expansion project. Alexander Library was one of them.

The architectural plans for Alexander Library specified that a new wing would be constructed perpendicular to the existing library building. The two would intersect precisely at the Special Collections and Archives department, located behind and below the Alexander Library sign pictured here. The good news was that the project included the construction of an improved Special Collections storage area, and new offices. The bad news was that construction would also cause a tremendous disruption to staff and complete, collections relocation.

The enormity of the project hit home when we realized that joining the two buildings necessitated the following work within the Special Collections and Archives office and collections areas: breaking through one outside wall, jack-hammering through concrete slab flooring, located just above the rare books stacks, digging footings for the new wing which would under pin the original building beneath the department, dropping in four story high "I" beams, which would extend from the sub-basement, a scant wall thickness away from where the rare books were stored, through the roof of the Library. The roof would be left open to the elements for an unspecified period of time. The engineer said that there was "90% certainty" that the department would experience some level of water damage to the basement level, and a significantly reduced, but still considerable likelihood of water damage to the sub-basement level. The department offices and collections were located in these two areas. Approximately one week later, when a hose became dislodged from a high efficiency water pump on the roof and very efficiently pumped water into the department, we up-ed his estimate to 100% certainty.

Obviously, the department staff anticipated that some or all of the collection would have to be shifted away from the construction areas, and that any collections

remaining in situ during construction would need protection. We were surprised, however, to find that the deadline for completing our preparations was much sooner than we had originally thought it would be. Without the luxury of a construction planning chart to inform library staff of exactly when the construction crew was to begin demolition and renovation, we were provided with only three weeks notice that the Special Collections and Archives collections and offices had to move in their entirety. With three weeks notice, we were told that the entire 100,000 items had to be moved, preferably off site. For obvious reasons, the construction crew felt that they would be more comfortable working unencumbered by the collections, so shifting collections away from construction areas was unacceptable to them. There was no consideration on their part to preservation issues or to collections accessibility and continued patron usage during construction. If the collections were relocated off site, it would require that they be closed to the public, virtually without notice, for a period of approximately one and one half years, a completely unacceptable circumstance to staff and patrons alike. Maintaining the accessibility of the collections during construction was one of the primary goals of the Special Collections and Archives staff.

The relocation option was unacceptable to Library staff for another reason, too. It presupposed that a single suitable alternate site could be found. This task proved to be impossible. As Special Collections staff madly searched for and surveyed other University property and commercial storage space for the collection's relocation, it became apparent that nothing suitable existed. Moving all of the objects to a safe, off site holding area within three weeks was apparently impossible. We needed to find an alternate plan.

By now, less than three weeks before the hard hats were to arrive, we realized that we needed immediate protective enclosure protection for the collections. They simply could not be moved fast enough to avoid the construction crew. The books would be near tremendous amounts of construction dust and debris, they would be possible victims of water damage due to inevitable leaks, and they would have to be hastily moved, most likely to less than ideal storage conditions. This is eventually what came to pass. As an aside, at the time of my departure, the collections were divided into at least five different

locations, and parts were closed to the public. Since then, less than one year later, the rare books have been moved twice, and some parts of the special collections have been moved five times.

Shrink wrapping the collections began looking like an attractive option for a number of reasons. Shrink wrapping volumes would produce easily manageable packages which could be moved quickly, and with reduced risk of damaging the collections in the process of moving them. Shrink wrapping would provide better dust protection than merely draping and sealing the area with plastic sheeting, and would be more cost effective than undertaking a collections cleaning project after the construction was finished. Shrink wrapping would provide a more thorough means of protecting the volumes from potential water damage. Furthermore, it would be advantageous to leave the shrink wrap on the collections for approximately six months after the collections were moved into their newly renovated space. New HVAC systems, new walls, spackle, paint, flooring, etc., would all be off-gassing during that time, and temporarily polluting the environment. Shrink wrapping the collections would reduce the exposure that the Rare Books and Manuscripts would have to these chemical by-products.

Once Rutgers made the decision to shrink wrap the books, plans were made immediately to hire and schedule a staff of 31 part time employees, rent machines, order materials, and upgrade wiring. Miraculously, everything arrived and was ready within a week and a half. We were left with nine days to complete the project. We operated 12 hours a day for those nine days, using six student workers at a time.

All of the advantages of shrink wrapping can be negated if the wrong type of film is chosen. In choosing an appropriate material, I consulted with Sue Lee-Bechtold, Conservation Chemist in the Research and Testing Laboratory at the National Archives and Records Administration, and Norvell Jones, also in the Conservation Department at the National Archives. Both were extremely helpful in providing insight into their own shrink wrapping project, in anticipation of the National Archives collection's move to Archives II in University Park, Maryland. After extensive testing, the materials chosen by NARA, was du Pont Clysar EHC. Rutgers chose the same.

Clysar EHC was deemed acceptable for the following reasons: the film is gas permeable thereby providing adequate gas exchange through the film and through the seals; it does not embrittle or yellow with age; it is a stable polyethylene / polypropylene copolymer; it contains no plasticizers; it remains durable at freezer temperatures; it does not give off harmful gasses; and accelerated aging tests indicated no accelerated degradation of volumes sealed in film. As I understand it, the National

Archives will probably remove the film from their collections within a decade after the collections move to Archives II. Rutgers is planning to remove the film from their collections, too.

Clysar EHC is available in various thicknesses and widths, and arrives on a roll, double layered with a center fold. It is a product in high demand. Lag time for orders is usually six weeks or more. However, in a pinch, non-standard size "offcuts" are readily available. Our vender, Brian Lynn, at Shrink Packaging Systems Corporation in Edison, New Jersey, was extremely helpful in finding suitably sized materials, and in making some appropriate recommendations. For Rutgers' project, only two different film sizes were needed: 6 rolls of 75 gauge 19" wide film, and 1 roll of 75 gauge 32" wide film. The total materials costs were approximately \$1,400.

Shrink Packaging Systems Corporation supplied the machinery for the project, as well. Rutgers rented two shrink wrapping machines and two heat tunnels (Beseler 1913MB M.H.2871 & M.H.2872, Beseler T-14-8 M.H. 2873 & M.H. 2874). They were a scaled down version of those already in use at the National Archives (Beseler 3020-GSM-A & T20-9). Floor and aisle space had to be measured to ensure that we could move in the machinery with relative ease. Electricians were hired to upgrade the wiring. Rental price, for one month, was approximately \$1,500., including delivery. Machine rental is available in monthly increments only.

The shrink wrap machines are two part. The primary component is the "L" sealer. This L-shaped sealing mechanism fuses the shrink wrap film on two sides, and forms a bag around the book. The third side has already been sealed by the previously sealed book, and the fourth side is the center folded edge of the film. The seal is made by a pulsed electrical wire that is only "on" when the sealing arm is fully closed, so the operator can never touch the live wire. It is automatically set to open when the pulse is over, and the film sealed. Its dwell time can be adjusted by the operator to suit the film thickness. Once the sealing arm has automatically raised, a conveyor belt carries the sealed object away.

The second component of the shrink wrap machine is the heat tunnel. It is in the heat tunnel that the film shrinks to conform to the shape of the object enclosed. This is also a conveyor belt driven attachment. The heat tunnel blasts the enclosed object with hot air. A heated platen below the belt ensures that the film on the bottom of the object is heated as well. The operator can control both the temperature of the heat tunnel, and the speed of the conveyor belt. The ratio of heat and conveyor belt speed in the tunnel determines how the film shrinks. A high speed and high temperature give equivalent results as low temperature, slow speed. In this way, it is possible to control not only how much heat an object

is subjected to, but also how taut the film gets around the object. Delicate objects, such as pamphlets enclosed in acid free envelopes, should probably not be subjected to the pressure of the film at all, and should be sealed only, eliminating the shrink tunnel step. For these objects, the resulting package looks like a loose, clear bag.

For extremely large or heavy volumes, which were either too wide to fit into the shrink tunnel, or too heavy for the conveyor belt, a 36" long "bar" sealer was used. (42) A "bar" sealer seals one side of the film at a time. (43) Combined with the hand held heat gun, it is an extremely labor intensive operation. It also produced much less satisfactory results than the fully automated machine because, if incorrectly used, the heat gun often caused holes in the film. Rewrapping these oversized objects demanded too much time and handling, so for those books which needed the bar sealer, we opted not to use the heat gun at all. The film was not shrunk to size around the object. Thankfully, very few oversized objects required the "bar" sealer. The automated "L" sealer and shrink tunnel combination worked for approximately 95% of our collection.

The most difficult part of the project was devising a work plan that would provide the machine operator with a constant flow of work, while ensuring that books were returned to the proper location on the shelves. After a half a day of trial and error, an efficient system was finally found. More difficult than devising a work plan, is describing it. Please endure the description's redundancy for the sake of clarity.

The key feature of the system is that whoever removes books from the shelf, follows them through the wrapping process, and returns them to the shelf. Henry Ford style production lines simply didn't work, except that the persons operating the shrink wrap machines do remain stationary.

The system that worked for the project is relatively simple. Briefly, each machine was manned by a team of three people. The machine operator did not rotate positions, whereas the other two people did. While one person was at the end of the conveyor belt, checking the quality of the shrink wrapped books which he had brought, the other person retrieved and vacuum cleaned another shelf of books. Whoever pulls a shelf of books from the stacks returns them to the stacks.

All aisles were marked as "one way", to avoid book truck traffic jams. A color code system was used. Students were provided with three color coded, 6" x 24" free standing markers, each clearly labeled with a left-to-right pointing arrow. Everyone gets a different color, which designated their work. Based upon one truly absurd debate about the distinction between teal blue and powder blue, I can tell you that similar colors are confusing, and should be avoided. One marker was placed on

the empty shelf of books that they moved, one was placed on the filled book-truck at the front of the conveyor belt, and one was placed on the empty book-truck at the end of the conveyor belt. The arrow drawn on each marker served as a reminder to pull the books from left to right when transferring them. Arrows proved to be extremely useful because persons facing each other with a cart between them have opposing left hands. They would otherwise pull books from opposite ends of the book cart. Arrows minimized confusion. Students placed flags, that were the same color as their markers, at the end of the aisles to minimize getting-lost-in-the-stacks time when returning with their wrapped books.

Let's describe this process again. Books transferred from a shelf to the book truck have a colored marker placed on them. The empty shelf from where they were removed has an identical marker placed on it. Each marker has an arrow indicating left-to-right drawn on it. A third identical marker is also placed on the book truck so that when the books are first vacuumed and then brought to the machine operator, the third marker can be placed on the empty book truck, waiting at the end of the conveyor belt. The person at the end of the conveyor belt is responsible for inspecting the wrapped books. Unacceptable packages are unwrapped by him, and handed back to the machine operator to be re-wrapped. When the machine operator has completed a cart load of books, he hands the color marker from his empty book truck to the person with the now filled book truck at the end of the conveyor belt. This person then returns the wrapped books to the shelf. The machine operator then moves the empty book truck to the end of the conveyor belt, and the next team member, who has a different color code, hands the machine operator another filled book truck. As before, the person who brought the book truck then takes a place at the end of the conveyor belt, and puts his color marker on the empty book truck waiting there.

As the students worked, I was available to supervise in the proper handling of materials, and act as coordinator. In this way, we were able to keep lag time between tasks to a minimum, and to maintain a constant flow of interest and books to the machine operator and other staff members.

I am thrilled, and relieved to report that we completed the cleaning and the wrapping of the 30,000 items on time and under budget. We have also had a final cost per volume of 23 cents, however Rutgers wrapped multiple volumes together. Our labor was paid \$6.50 an hour. Total labor costs, including my time, were \$4,300.

Obviously, the success of Rutgers' project probably has less to do with organization and more to do with the equipment chosen, and a blissfully enthusiastic staff of part-timers. Each staff member was provided with the

full account of our saga, and because many were library school students, they were sympathetic to the point of workaholic. It was only by maintaining a regular schedule of coffee breaks and lunch breaks that I was able to pry them away from their appointed tasks. I am truly grateful to them.

I relied upon many sources of advice while completing this project. The first was The National Archives. By arranging a site visit to the NARA to observe their shrink wrap project in operation, and by timing NARA staff in each component of the shrink wrap process, I was able to estimate the number of machines we needed, the amount of staff and materials needed, and a feasible work pattern. The advice that Norvell Jones and Sue Lee-Bechtold gave during my brief visit was golden. I also called upon the Department of Packaging engineering at Rutgers College of Engineering. They were able to refer me some extremely reputable vendors, including the one already mentioned, Shrink Packaging Systems Corporation. Our account representative, Brian Lynn, by the way, was a graduate of their Packaging Engineering program. And, of course, I relied upon the advice of my Packaging Engineer father, Frank Stagnitto. I am very grateful to all of them. I would also like to thank Mr. Ron Becker, the Head of the Special Collections and Archives at Rutgers University. He maintained a remarkable calm and good nature in the midst of bedlam. He and his staff are heroes, in my eyes, and even in this project, it was a pleasure working with them.

MATERIALS

Original Estimate: materials- for shrink wrapping 30,000 items

Film: Clysar EHC, 75 gauge 18" wide center fold

<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
16 rolls	\$162.	\$2,592.

Film: Clysar EHC, 100 gauge 22" wide center fold

<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
5 rolls	\$185.42	\$971.10

Total- Estimated Cost of Materials \$3,563.10

Actual Cost: materials- for shrink wrapping 30,000 items

Film: Clysar EHC, 75 gauge 19" wide center fold

<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
6 rolls	\$175.78	\$1,054.68

Film: Clysar EHC, 75 gauge 32" wide center fold

<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
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1 roll	\$282.12	\$282.12
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Total- Actual Cost of Materials \$1,336.80

Value of materials to be returned and refunded by supplier

Film: Clysar EHC, 100 gauge 15.5" wide center fold

<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
6 rolls	\$137.04	\$822.24

Film: Clysar EHC, 75 gauge 19" wide center fold

<u>Quantity</u>	<u>Unit Price</u>	<u>Amount</u>
4 rolls	\$175.78	\$703.12

**Total-Refund Due for Materials Returned
\$1,525.36**

LABOR

Original Estimate: labor- for shrink wrapping 30,000 items

10 days work, one and one half shifts per day, six persons per shift

66 man hours per day x 10 days = 660 hours @ \$6.50/hour

Total- Estimated Cost of Labor: \$4,290.

Actual Cost: Labor- for shrink wrapping 30,000 items

Student help:

Thurs. 2-20-92 to Wed. 2-26-92
309.83 hours @ \$6.50/hour

Thurs. 2-27-92 to Sun. 3-1-92
216.5 hours @ \$6.50/hour

Total @ \$6.50/hour 526.33 hours = \$3,421.14

Supervisory help:

Gisela Mahler 25.5 hours @ \$8.50/hour = \$216.75

Janice Stagnitto 25 hrs. overtime @ \$23.25/hr. = \$581.25

Total cost of supervision \$798.00

Total- Actual Cost of Labor: \$4,219.14

MACHINERY

Supplier:

Shrink Packaging Systems Corporation
15 Progress Street
Edison, New Jersey 08820-1102
(908) 753-2525

Brian Lynn, Sales Rep.

Machine: Beseler 1913 MT/T-14-8

<u>Quantity</u>	<u>Unit Price*</u>	<u>Amount</u>
2	\$700.	\$1,400.

*Rental for one month

Machine: M. Latter 36" Bar Sealer with Heat Gun

<u>Quantity</u>	<u>Unit Price*</u>	<u>Amount</u>
1	\$56.00	\$56.00

*Rental for one month

TOTAL- Actual Cost of Machinery Rental \$1,456.

Total Cost of Shrink Wrapping Project*

<u>Materials</u>	\$1,336.80
<u>Labor</u>	\$4,219.14
<u>Machinery</u>	\$1,456.00

TOTAL \$7,011.94

COST PER VOLUME

@ 30,000 VOLUMES 23 cents each

@ 25,000 VOLUMES 28 cents each

* Costs not figured into the equation:

- cost of electrician
- cost of electricity
- cost of site visit to National Archives (approx. \$60.)

HOW TO REMOVE SHRINK WRAP

Using a blunt nose scissors, make a small snip in the film in an area away from the binding, such as in excess film between the upper and lower boards at each corner. Here the square of the book holds the film away from the text block. With this small cut made, tear the film away from the book. Do not pull. If you reach a point where you are unable to tear the film, then hold it away from the covers and snip it again with the blunt nose scissors.

Ideally, the film should be opened around the book like an opening flower. Once the film has been opened flat, then the book can be lifted from the shrink wrap-

ping.

Never pull the film off a book. Doing so can damage delicate areas of the binding such as end bands, joints, labels and end caps. It can also cause delicate, and previously damaged areas to tear or be lost.

WHO SHOULD REMOVE SHRINK WRAP

Shrink wrap should be removed from books by Library staff only. Patrons should never be permitted to remove the wrap themselves.

WHEN TO REMOVE SHRINK WRAP

Shrink wrap should be removed on an item by item basis as items are called by patrons.

With regard to the bulk of the collections, the shrink wrap should be removed from them anywhere from six months to one year after renovation and relocation has been completed. Although there is no quantifiable evidence to suggest that leaving the Clysar EHC on the collections for a longer period of time is detrimental, it is not to be considered a permanent means of protection, and it is not a substitute for more conventional means of preservation.

**Janice Stagnito, Book Conservator
Smithsonian Institution Libraries
Washington DC 20560**