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Nebraska's Library Depository Retrieval Facility

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UNL's Library

Depository Retrieval Facility

Introduction

Beginning with Harvard University in the 1980s, the use of high-density storage for library materials has steadily increased over the past two and a half decades (Nitecki and Kendrick, p. 1). This paper looks at design and implementation issues in building a facility at the University of Nebraska-Lincoln (UNL) in 2004-2005, adding to the expanding body of knowledge and experience in the planning, funding, building, operation, and staffing of such facilities. A new element in the UNL Libraries' delivery of service is the Library Depository Retrieval Facility (LDRF). Completed in June 2005, Nebraska's Library Depository Retrieval Facility is an example of a recently constructed high-density storage facility among academic libraries in the United States.

The UNL Libraries system is the only comprehensive research library in Nebraska. Its mission is to ensure that Nebraskans have access to an organized collection of information resources, to provide assistance needed to use library

resources and services effectively, and to preserve information for future generations. The University Libraries (Don L. Love Memorial Library and six branch libraries), together with the Marvin and Virginia Schmid Law Library, have a collection of nearly three million print volumes and more than 44,000 current serial subscriptions. The branches serve a wide array of academic pursuits: architecture, biological sciences, chemistry, engineering, geology, math, music, physics, agriculture, and consumer science on City Campus and East Campus in Lincoln. The UNL Libraries serve the entire university community, visiting scholars, and countless other students and researchers across the state and region by blending traditional services with today's digital library innovations.

Background and Need

By the early 1990s, the UNL Libraries book stacks were filled to over 90% capacity. In many areas of the collection, adding new materials or re-shelving existing materials required shifting the current collection to make space. To ease the shelving crisis, the Libraries had also located over 190,000 volumes off-site in two rented warehouses that would be filled within a few years, thus requiring additional storage space. While the number of electronic resources available for purchase has increased annually, e-resources still represent less than half of the Libraries' acquisitions budget. The UNL Libraries still purchase approximately 40,000 volumes a year, and as a result have a continued need for increased shelving to house printed materials.

High-density storage costs are on average considerably less than the expense of building a traditional library building. Examples include Orbis's (a coalition of academic libraries in Oregon and Washington) construction cost of \$3.75 per volume for a high-density facility, as opposed to \$13.39 for traditional library space, and Yale's report of off-site storage being 1/10th as expensive as traditional library open stack space (Kohl, pp. 247-248). Shelving capacity in a traditional library is approximately 75,000 volumes in 10,000 square feet of space. With high-density shelving, more volumes can be housed in significantly less space. Studies done in Minnesota indicating a 40% gain in storage capacity when using high-density models (Kohl, p. 247). Another author reports the efficiency of high-density storage to be more than seven times that of conventional library construction (Seaman, p. 94).

Research on other storage options led UNL Libraries to the conclusion that a high-density, climate-controlled facility was the best choice for long-term preservation of materials. A high-density storage facility located on the East campus of UNL, holding approximately one million volumes, was conceived to provide the Libraries with enough capacity to shelve materials throughout the rest of the system for the next 10 years. The project originally began as a University of Nebraska system-wide project for a shared storage facility among the four campuses (two located in Omaha, one in Lincoln, one in Kearney).

However, political, economic, and other practical considerations resulted in a single-campus project at UNL.

Phase One: Development of Program Statement, Funding Model, Site Visits, and Timeline

Program Statement and Early Planning

The initial program statement was developed in 1993, ten years prior to approval and funding for the LDRF. Investigation before development of the program statement included a site visit to a high-density storage facility in Texas, with the bulk of the initial program statement based on research from that visit. A second, revised program statement was done in 1997. Unfortunately, this document was not reviewed and updated sufficiently once the project site was established in 2003, and so did not contain essential elements pertaining to that location. This turned out to be a costly oversight. An expensive modification to the soil had to be made prior to construction. A critical step in the early planning of the LDRF was a special report with recommendations prepared in 2003 by the Chair of the Cataloging Department. This report was fairly comprehensive in identifying and discussing the steps involved in selecting, preparing, and managing materials for the LDRF (Herzinger, p.1).

Funding Model

The total cost of the LDRF was just under three million dollars. A proposal was developed to construct and operate a high-density storage facility using funds allocated for three branch libraries, Biology, Chemistry, and Physics, that were closed as a part of this project, and funds for the leases on two rented warehouses (Storage 1 and Storage 2). The Libraries also gave up four FTE staff positions to assist in the funding. The UNL Chancellor's office also provides a portion of the funding each year. A Bond Debt Service Account was established to pay off the LDRF at a total cost in excess of five million dollars paid over 20 years. Each fiscal year principal and interest are due on an established schedule, with audit and service fees added on.

Site Visits

In the fall of 2003, a team from UNL, including architects, facilities and library staff visited the University of Missouri-Columbia high-density storage facility and met with their counterparts to gain practical insight as to what went well and what they would change during the planning and construction of their facility. Other UNL teams visited high-density storage facilities at Arizona State University in Tempe, PASCAL in Aurora, Colorado, Washington D.C.'s regional facility, and the University of Nevada, Las Vegas. These site visits

were extremely useful in planning and implementation of the project, and well worth the time and expense involved in sending staff.

Construction Timeline

1993	Preliminary Program Statement
1997	Revised Program Statement
June 2003	Project approved by UNL Board of Regents
September - December 2003	Building design begins
December 2003 - April 2004	Librarians identify collections for LDRF
January -March 2004	Building construction documents reviewed
March 2004	Finalizing of design and construction plans
April 2004	Bid process for construction
June 2004 - June 2005	Construction of the LDRF
April - May 2005	Bid process for moving company
May - June 2005	Meet with moving company to plan moves
June - August 2005	Move 400,000 items into LDRF; close 3 branches; vacate Storage 1 & 2; create science wing in main library
August 2005	LDRF opens for business
March 2007	Initial load-in of 400,000 items sized; additional load-in of materials until facility is filled

Phase Two: LDRF Planning and Construction

Selection of Architects and Construction Company

The Libraries were fortunate in that the architecture firm, the Clark Enersen Partners, selected for a major renovation of the main library from 1999-2002, was also selected for this project including many of the firm's same personnel. The Dean of the Libraries and the Libraries Facilities Manager met regularly with the university project manager and a core group of architects and engineers to construct a basic building plan.

The construction company was chosen on the basis of lowest bid. Following university procedure, a kick-off meeting with all the principals of the project was held. This meeting was very helpful, since most of those attending were not familiar with the type of building being proposed. This process also helped potential bidders understand that the Libraries were full partners in the project who expected equal representation and input as the project

progressed. The Dean of Libraries and the Facilities Manager both attended the monthly project meetings during the one-year construction phase. The importance of building positive rapport with facilities, architectural, and engineering staff, as well as project managers and inspectors, was extremely important. Since library staff did not have a working knowledge of construction terms and processes, it was important that they feel comfortable asking for explanations and definitions as the project progressed. Attendance at these meetings also indicated that we were interested and invested in making sure that the building met the Libraries' specifications and that we were willing to actively participate in the process.

Selecting and Working with Other Consultants

The expertise of consultants in the building of a high-density storage facility is critical. The Libraries contracted with Reese Dill, of Dill & Company, a noted consultant and specialist on high-density storage facilities, for the following services:

- Configuration of the storage and material handling systems, including preparation of drawings that show the basic configuration of the storage systems and estimate the number of shelves, book trays and boxes, and total book storage capacity.
- Configuration of the building to accommodate the storage material handling and processing systems, including discussions and consultations with the project team and the architects.
- Preparation of requests for proposal for the storage system and order-picking vehicle, including providing drawings and specifications for the following equipment: the complete shelving system; the guide rails for the order picker vehicle; all of the steel guarding of the shelving and walls in the cross aisle of the storage room, except for the bollards that must be cast into the floor; the order picker vehicle, work platform, batteries and charger; carts for moving loaded book tray; and a vacuum book-cleaning system
- Preparation of equipment cost estimates during the design process, including development of the storage system configurations, preparation of equipment cost estimates based on the prices obtained for similar systems for other high-density book storage facilities.
- Help during construction and equipment installation, including monitoring and approving or disapproving vendor approval drawings and test shelving components.
- Development of the shelf location planograph, including preparing drawings showing the locations of every shelf purchased along with the exact spacing of these shelves.
- Preparation of a request for proposal for book trays, including determining the quantities for each size book tray. The quantities of

each size book tray were designed to fit the anticipated initial requirements for the University of Nebraska facility.

The Libraries retained the consulting services of the Munters company regarding a desiccant heating, ventilation, air conditioning (HVAC) system for the facility. A desiccant system was chosen over a conventional HVAC system because of Nebraska's climate (which is exceptionally hot and humid in the summer), energy consumption, and dependability. The HVAC system was put out on bid, and Munters was the successful vendor. Overall, the desiccant system proved to be a good choice. UNL facilities staff were hesitant about the choice at first, since they had no experience with such a system, but have found it to be no more time-consuming in terms of maintenance than conventional systems. Energy costs for conventional systems can be prohibitive, given the 50-degree temperature and the 35% relative humidity specifications for these types of facilities. The desiccant system is much more energy-efficient, making up for the higher initial purchase and installation costs.

The Libraries also retained the services of Face Consultants, a company that specializes in installing and overseeing the installation of superflat floors. A superflat floor is a requirement for any high-density storage facility, primarily because of the 30-foot shelving. It must sit on a superflat floor or it will be very unstable at the top. Also, the order picker needs a superflat floor to operate. Specifications for a superflat floor include 11 inches of concrete that meet certain requirements using the latest in digital floor-measuring technology. Face Consultants worked with a local concrete company to insure that the floor was installed well within the specifications required.

Site Selection and Soil Preparation

The site for the facility, located on the university's East Campus, had been identified on the university's master plan several years before funding became available for planning and construction. Once the budget was established and the architects and engineers began talking about the building, they realized that a weight bearing issue might arise, so soil engineers were brought in to test the soil. The soil engineers verified that, without intervention, the building would sink and/or shift over time. The smallest change in the floor level could render the building unsafe.

Two primary options to remedy the soil situation were presented. One was to drive a number of pilings into the ground and build the structure on those pilings. The other was to surcharge the site, a process that involved piling approximately 22 feet of dirt, equivalent to the weight of the building and its contents, on the footprint of the building, and leaving the soil there for approximately six weeks until the ground had compacted sufficiently to support the finished weight. Both options were costly in terms of time and money, but surcharging was determined to be the more cost and time efficient of the two.

The unplanned cost of the surcharging process necessitated a reduction in the size of the facility, as the total budget for the project was non-negotiable. Originally designed to accommodate one million volumes, the facility was reduced in size to hold approximately 800,000 volumes. The soil surcharging also required approximately eight weeks to accomplish, threatening to delay the project by a few weeks. However, the resulting smaller building was finished by the original deadline.

Building Design

The University of Missouri-Columbia (UM-C) Libraries high-density facility featured a flat roof that was blown off by a tornado a few years after it opened. Based on this experience, the architects designed a roof and building to withstand straight and tornadic winds, as well as other environmental factors, such as earthquake fault lines. The architects who went on the site visit to UM-C were also influenced by the exterior design of the high-density storage facility, located in an industrial park area and having the same warehouse design as surrounding buildings. Even though Nebraska's facility was not intended to be a publicly accessible, the architects wanted it to have a certain design flair that would distinguish it from other buildings in the area and proposed an interesting pattern on the exterior representing books on shelves, accomplished by laying bricks of differing colors, textures, and sizes in a band around the top half of the storage portion of the building. After some deliberation by the university Aesthetics Review Committee, the design was approved.

Landscaping and Water Control

The Libraries worked with the campus landscaping department to devise an appropriate plan that included plants requiring low moisture and a minimum of care. Landscaping also needed to be designed to keep water from entering any part of the facility foundation and flowing away from the building. The landscaping staff developed a plan featuring a hardy variety of low maintenance turf and ground cover that prevents erosion, adding a few trees to fill in space between existing trees and a few color plantings by the front door for curb appeal.

Building Security

Exterior security consists of a streetlamp overlooking the parking lot and lighting installed around the perimeter of the building. Surveillance cameras were mounted on the exterior of the building and are monitored 24/7 by campus police. The exterior doors are locked during the day and access is controlled by staff or by card access networked on the campus proximity card device system. This allows for monitoring who has been in and out of the building. Campus Police patrol and observe the area and facility regularly.

Phase Three: LDRF Project Management Charge and Activities

Phases Two and Three occurred concurrently. Phase Two was accomplished externally and involved the Dean of Libraries, the Libraries' Facilities Manager, and architects, consultants, and UNL Facilities personnel. Libraries faculty and staff accomplished Phase Three internally.

A year before planning for the LDRF began, formal Project Management training for key Libraries personnel, including department chairs and unit heads, was conducted by UNL Information Services staff, as part of the Libraries ongoing Learning Organization. Additional Project Management training specific to this project proved to be a major factor in the successful identification and operation of the LDRF Project Team, established in August 2003. The management of the LDRF project was distributed throughout the organization and ultimately involved a substantial number of Libraries faculty and staff.

The Project Team, lead by the Libraries Associate Dean for Administration, was charged with responsibility to plan and coordinate, and communicate about, the activities needed to ensure that the Libraries collections were moved into the facility by August 2005, and to ensure that the three science branches (Chemistry, Physics, and Biological Sciences) were closed by fall semester, 2005. The timing for this project assumed that the construction schedule would be met and that the facility would be completed on time.

The largest challenge the Project Team faced was devising a way to move 400,000 items and keep them in call number order. To generate funding for the bond debt, the Libraries had to close the branches and storage facilities as soon as possible following completion of the LDRF. This resulted in a six to eight week window in which to move collections, making a load-in by size impossible. We also needed to be able to retrieve items for Interlibrary Loan and Document Delivery. In the end, nine separate call number collections in Dewey, LC, and SuDoc were loaded into the facility and mapped by the LDRF manager in a manner that allowed us to retrieve materials for users and to begin the re-sizing of the collections.

Project Management Working Groups

Many activities needed to be coordinated by the overall Project Team and the working groups formed by the project team. Below are the charges for these working groups.

Love Layout Charge: Plan, coordinate, and communicate about the activities needed to ensure that the Libraries' collections are moved into the storage facility by August 2005 and that the three science branches (Chemistry,

Physics, and Biological Sciences) are closed by fall semester, 2005. The timing for this project assumed that the construction schedule would be met and the facility completed on time. In order to meet the general charge outlined above, the layout of Love library was carefully planned to accommodate all necessary materials for the foreseeable future. With the removal of a number of materials to the LDRF, a rare opportunity to re-envision the placement of non-science collections occurred as well.

Operations and Access Charge: Determine cost-effective recommendations for on-going preparation of general and special collections entering the LDRF from throughout the UNL library system after the initial load of materials. Processes include packing, delivery to LDRF, cleaning, sizing, and delivery to storage bays. In addition, systems for access, including retrieval and copying, scanning or campus delivery, and return to storage bays, should be prepared for recommendation to the project team. All aspects of staffing, including training, should also be addressed. The sub-committee members should identify the separate issues to be addressed and solicit staff to serve on working groups. For example, the ILL/IQ Advisory Group served as the working group for access issues. (This group proved to be unnecessary, because much of the work was covered by other project management working groups, or was taken over by departments or already existing committees.)

Preservation Charge: Determine cost-effective recommendations for preparation of general collections materials prior to deposit in the LDRF, including how to best handle materials needing treatment, and ongoing preservation needs of the materials on deposit. In conjunction with the Special Collections group, recommend preservation steps for special collections and archival materials.

Special Collections Charge: Determine special collections or archival materials to send to the LDRF, aiming for a minimum of 85% shelving capacity in Love Library. Prepare recommendations on inventory control and bar coding, boxing, shelving, and security and transport of rare volumes or archival materials between the LDRF and Love Library. Work with the Preservation Committee to recommend preservation steps for special collections and archival materials. Work with the Biology, Chemistry, and Physics Libraries to determine items to be transferred to Special Collections or Special Collections Storage. Similarly, make recommendations regarding materials in Love Library Stacks, in Storage 1, and Storage 2.

Technical Services Charge: Several groups within the Technical Services department played key roles in preparing materials for the LDRF. The initial solution to the Libraries' storage problem was renting two large warehouses a few miles off campus to house approximately 190,000 volumes, including uncataloged collections from Special Collections. When the decision was made to move ahead with building the LDRF, Technical Services staff and temporary

employees were assigned to the area to begin the work of preparing the bibliographic, item, and holdings records for this material, so that the books would be ready to move when the LDRF was completed. Staff weeded materials selected by liaison librarians, cataloged and barcoded items, separated items needing preservation or conservation work, and marked items to be moved to the LDRF from the several locations (three closing branches, Love Library, Storage 1 and 2).

Communication

The Libraries' learning organization model was perfectly suited to the project, and enhanced communication of project goals and activities. Nearly every Libraries' staff member was involved in some aspect of planning or implementation of the project, which gave everyone a sense of ownership. Goals of the project communication plan were to educate a variety of audiences about the need for and implementation of the facility, and to increase awareness of the resulting services. General and specific talking points were developed and distributed. Target audiences and stakeholders were identified and messages developed to meet their specific needs.

A public LDRF website, linked to the Libraries' *What's New* page, was launched early in the process. The primary objective of the web page was to inform external audiences of the need for the facility and progress in its development. The website included information on what, where, why, when, deadlines for input if needed, service information, pictures, progress reports, announcements of moves, FAQ's, and a timeline. Other ongoing communication activities included announcements using university-wide newsletters and e-mail postings, frequent e-mail updates to staff, including photos of construction progress, assisting liaison librarians with communication to faculty, giving updates at Library Executive Committee and library all-staff meetings, and promotion of campus delivery services.

Phase Four: Occupying the LDRF

Construction of the LDRF was completed and the building turned over to the university in June of 2005. Determining the order in which to re-locate nearly one million volumes was a major logistical challenge. The Libraries had a two-month window in which to vacate the three science branches, empty the two rented storage facilities, and relocate some 200,000 volumes from the main (Love) library in order to accommodate the same number of items from the closing branches. The first task was to move nearly 400,000 items into the facility. The planning that the project team and working groups had done culminated during a six-week period when the collections from the three branches, two storage facilities, and large sections of the main library collection were placed in trays and moved. Current materials in the Chemistry, Biological Sciences, and Physics libraries were moved into Love Library,

creating a science wing in Love South. Space was made available by removal of older materials from across the library's collections to the new storage facility.

Branch Closings

Four months prior to the scheduled closing of the three science branches, the facilities manager and another Libraries staff member visited each library and inventoried all non-shelving equipment. These inventories were later put into an Excel spreadsheet and distributed to remaining units in the Libraries. Personnel in those areas were allowed to select items desired for their units. Libraries department chairs and the dean made final decisions on the disposition of items with input from the facilities manager. Items not assigned to a new library unit were offered to the academic departments where the closing branch libraries were located. Remaining items were taken to university inventory and shelving was distributed to other units at the university. This re-assignment process took approximately six weeks.

Several months in advance of the closings, the facilities manager and one of the associate deans visited representatives from each of the departments to explain the timeline and plans for formal closing of the branches, and to outline service for delivery of materials to departmental and faculty offices following the branch closings. Although this service has not been heavily used to date, it was an important transitional strategy.

Just before the branches closed, a combination reception and information sharing session was held for faculty, staff, and students in each department to thank them for their support of the branch libraries and to explain how they could continue to use the Libraries. Representatives from reference and interlibrary loan gave demonstrations on how to use the online catalog to order intra-campus and interlibrary loan materials. These sessions were very successful and well worth the time and expense to arrange.

Staff retention was a high priority for the Libraries, so through planning and natural attrition, all permanent employees from the closing branches were transferred into other positions within the Libraries. Libraries administration met with the affected employees to help identify positions that the staff would find interesting and rewarding. Most staff had been in their branches for a number of years, but the transition to different buildings and new positions have been successful and well received.

Move Bid Process

A succinct and well-organized Request for Proposal (RFP) was vital to a well-organized move, particularly one this complex. The Libraries reviewed several moving bid documents from other institutions, including Tulane University, the UNL College of Dentistry, and the Seattle Public Library. If the

move involves multiple sites, it is important to specify where the locations are on campus and provide maps. In our case, we toured prospective vendors through all of the potential locations in which they might be working. The UNL RFP also broke the project down into specific phases for ease of understanding. The need for planning and communication on the part of the mover as well as the Libraries should to be emphasized at every opportunity. UNL held a mandatory pre-bid meeting for all interested contractors and, as stated above, provided a tour of facilities, as well as visual aids (book trays, photos of existing high density storage facilities, etc.) Vendors were also asked to provide a description of their book-moving methodology, proof of license to perform work in the state, to specify their qualifications, and to provide references. (UNL RFP available upon request). A vendor was selected in May 2005 and Libraries staff began to work with the moving company, Library Design Systems, Inc., immediately thereafter.

Working with the Mover

The LDRF manager or the stacks manager, or sometimes both, were on site at the beginning and ending of each day's move. Movers and Libraries staff met early each morning to go over that day's work plan, changes, and issues. Progress was reviewed and the next day was planned at close of each day. Both Libraries managers gave the moving work crew their cell phone numbers and asked that they be contacted any time there was a question or problem. Periodic inspections of the work including items moved, shelving, and damages to facilities were conducted, with photos and documentation submitted to the Libraries administration as well as the moving company. Libraries staff spent a substantial amount of time confirming all aspects of the move, asking to see the mover's calculations when and if issues of accuracy arose, and documenting amended work plans.

Although the project had several measures of success, a major criterion involved the timely completion of the move. Movers were able to accomplish this daunting task with very few unexpected calamities along the way. The LDRF manager and the system stacks manager provide 24/7 information and assistance to the moving company staff during very long, hot days in May and June 2005. The move was accomplished within the time frame identified. Faculty and staff were extremely flexible in terms of meeting deadlines, identifying materials to be weeded or moved into the LDRF, and working with the project management team and the movers.

Phase Five: Setting Up and Operating the LDRF

Equipment and Furnishing

Discussion with staff at site visits to other high-density storage facilities provided us with practical information with which to make decisions regarding

equipment and furnishing for the LDRF. We wanted the furnishing and equipment to provide as much flexibility in their arrangement as possible to allow for workflow adjustments. Work in the processing room entails repetitive activities, so providing ergonomically designed furniture and equipment was important to prevent injuries (Atkins). Staff also needed the option of sitting or standing, so tables were purchased that can be easily raised and lowered. Ergonomically adjustable task chairs, recommended by the architects but not tested sufficiently by staff, proved not to be as comfortable as hoped and have been, for the most part, relegated to a corner of the work space. Cushioned floor mats provide some measure of relief for staff while standing, although chairs and carts do not roll easily over them, so most of those have also been relocated.

The processing room is carpeted which is a benefit to custodial staff, however, pushing oversize carts around the area is difficult and would be easier had a harder surface been chosen. All-in-one computers were selected and are working adequately for most tasks. Overall, managers and staff are satisfied with the choices made, but over time additional adjustments will be made. For example, wireless access throughout the facility should have been indicated as a priority in the initial planning, rather than as an afterthought. Wireless access was added after completion of the facility, and is available throughout the processing area, which is essential for problem solving by technical services staff using laptops. Using laptops in the storage area of the LDRF is useful for mapping the collection, but not having wireless access in this area is proving to be a concern in terms of real-time cataloging and problem solving.

One of the items added post-completion of the building was necessary was an announcement system to alert the manager and assistant manager when visitors are at the processing room door. A doorbell system was installed so that if personnel are in the storage bay, they hear a bell.

Shelving and Carts

Before the shelves were installed, the shelving layout had to be appropriately configured. This was done by using a planograph; a document that shows the ideal placement of shelving according to the tray sizes that will be needed. One goal of the planograph is to change as few shelves as possible once they are installed. This document is best prepared by a consultant, Reese Dill in our case, experienced in laying out facilities built on the Harvard Depository model. Depending on the width of the trays, 4-8 trays can fit across a shelf, and these are shelved two deep. Therefore, both the front and back rows of a shelf must have the same size of trays. Also space must be set aside for oversized items and other materials that may be stored, such as archival boxes, materials in other media, folios and so forth. Space to store unassembled trays is also required. The LDRF manager found that making

charts of the shelves, either on paper or computer, helpful in knowing the location of various shelf sizes and which ones have been filled. Attempting to determine this information visually while on the picker is difficult because of the height of the shelves. The manager of the high-density facility at PASCAL suggested putting large shelf number labels on the shelving posts between the sections to assist staff members retrieving or re-shelving materials, a technique we adopted.

The site visit to Arizona State University supplied information on the efficacy of using specially designed book trucks, in this case from Gryphon Industries. Purchase of specialized book carts is highly recommended. These carts are essential for moving books in trays both manually and by the order picker for book retrieval and shelving. They can also be used in regular stacks for shifting large amounts of materials. An adequate number of good quality wooden book trucks are also a must and need to be sturdy enough to safely handle at least 200 pounds. In our experience the wooden trucks performed better than the metal ones.

Trays and Sizing Templates

Trays used to store materials on the shelves are acid-free cardboard and come in several heights and widths. The number of trays needed in each size is determined as precisely as possible and are best ordered in large quantities, cutting down on the per item cost. The trays are shipped flat and shrink-wrapped on a pallet so storage space must be allocated for the unassembled trays. Each order should be checked to be sure the trays have an 8.0 pH or greater. This level of acidity helps preserve paper in older books and prevents or slows deterioration as long as possible. Handles for each end of the trays must also be ordered, as do color-coded labels that indicate the tray sizes.

LDRF staff assemble trays as needed, including the handle on each end to enable them to be pulled in and out of the shelves. The color-coded sticker with the letter indicating the size of the tray is applied to the end of the tray that will face the aisle when shelved. For example, "A" trays might have a blue "A", "B" trays a yellow "B", etc. These stickers help visually determine the size of the tray. Assembled trays of various sizes are kept on book trucks in the processing area and are filled as books of that size arrive. Each book truck should hold only one tray size. Some trays fill rapidly and others not so quickly, depending, obviously, on the books being sized. Items that seem irregular should be set aside for further investigation. Oversized items, both in height and/or width, which do not fit into trays, are laid on the shelves without trays.



Gryphon cart with trays of varying sizes

Five sizes of trays are used for the vast majority of material, ranging from A (smallest) to E (largest). All of these trays are 18" long, allowing for trays to be shelved two deep on 36" shelves. We found the following breakdown of tray use by PASCAL in Colorado to be very helpful in preparing for purchase of trays for our facility:

A Trays hold about 20 volumes and are being used by 5% of their collection.

B trays hold about 15 volumes and are being used by 70% of their collection.

C trays hold about 12 volumes and are being used by 12% of their collection.

D trays hold about 10 volumes and are being used by 12% of their collection.

E trays hold about 7 volumes and are being used by 1% of their collection.

Sizing templates were also needed, and the LDRF manager constructed one based on a design supplied by Reese Dill and painted the various size outlines to mimic the color-coded labels for the trays. A sample book-sizing template can also be found in Nitecki and Kendrick, p. 176.

Having a back-up tray supplier is important, since the main tray supplier was out of production for several months due to a natural disaster in the

eastern part of the US. One of the issues to consider is institutional purchasing rules that can result in a lengthy and involved process for a one-time purchase of this type, or multiple suppliers for the same item. The initial supplier has since been able to provide us with trays, but we are prepared to handle this should the situation arise again.



Tray assembly area and color-coded sizing template (right)

Order Picker

A major investment and an item that went out for bid was for the order picker, a specialized forklift used to retrieve materials from the high-density shelving units. The order picker is a custom-built, battery-operated machine that is modified by adding a steel platform for the operator to use as a work surface. The picker must meet OSHA safety standards. The Raymond Corporation, which won the bid for the Libraries' order picker, has an operator safety-training program which the manager, assistant manager, system stacks manager, and the circulation librarian/facilities manager completed off-site.

One building design omission was the lack of a water source for adding water to the order picker battery, a task that must be done regularly. However, adding a faucet to the waterline that supplies the OSHA-mandated shower located in the garage area and purchasing an inexpensive garden hose easily remedied this situation. Another necessary, but unplanned expense, was a spill kit for the order picker. This kit is essential if the order picker battery is damaged to the point that acid escapes, and should be purchased at the same time as the order picker. The OSHA-required sprinkler, although important to the operation, is not a sufficient safeguard.



Order picker being used to locate and retrieve items

Cleaning of Collections and the Facility

Initial planning for the LDRF called for installing a vacuuming system to clean the materials coming in to the facility, as recommended by our consultant and other staff at other facilities. However, after further consideration and an analysis of the collection by the Libraries Special Collections librarian, it was decided that the collection could be sufficiently cleaned with smaller vacuums and preservationally sound cleaning cloths. So far that has proven to be a good solution. Materials are also inspected for damage, mold, or insect infestation and dealt with accordingly.

The storage area must be kept clean, with no chemicals kept or used in the area, and a vacuum cleaner with a HEPA filter is required. Doors between storage area and work area are always kept closed, so contaminants do not enter the storage area. For that reason, all stairways, monitoring equipment, and access to the HVAC and telecommunication systems are on the outside of the building or in areas that can only be accessed from outside the storage bay.

Since access to the storage bay is restricted to library personnel, and custodial staff work evening hours, they have not been maintaining this area. Custodians clean the office/processing area on a regular basis; however, at this point, custodial support in the storage area would be useful. Negotiations are underway to resolve this issue.

Computers and Bar Code Readers and Printers

The LDRF work area is equipped with four computers in the work processing area, with two additional computers dedicated to processing materials for ILL and campus delivery. Computers devoted to processing materials into the LDRF require printers specially made for barcodes, as well as regular printers and barcode readers. The two computers in the ILL area are used to prepare materials that have been requested, for checking in returned materials, to scan materials, to use Ariel, and for e-mailing articles to requestors.

Specially designed barcode readers are able to read both existing OCR numbers and barcodes. Since OCR numbers are older technology, the possibility that such a reader may not even be available in the not too distant future could cause serious problems with timely workflow. Extra barcode readers were purchased so downtime due to machine malfunction can be minimized.

Barcode label stock was purchased in large quantities and in large rolls. Being able to print the tray and shelf barcodes, in addition to the item barcodes, is the most efficient method for labeling book trays. The barcodes for the trays are large and use a large type font so they are easy to read from the order picker. The book barcodes are smaller than the tray barcodes and must fit on the face of the book.



Workstation for generating barcodes for individual items

LDRF Operations

Although it is considered a branch library, operating the LDRF differs in several ways from running a traditional library. For one thing, the facility is not open to the public. Most of the tasks that are performed are technical services tasks. There is also a public services aspect to its operation, primarily circulation, albeit small in numbers since items selected for storage are less used materials. Those items that circulate are requested through Interlibrary Loan or Document Delivery. The technical services tasks will decrease over

time, and the public services increase, as the LDRF staff complete processing the 400,000 items brought into the facility during the initial load-in. Staff process, on average, 1,350 items a day, with a single-day record of more than 1,800 items (Fedderson, p. 1), and completed sizing of the initial load-in in March 2007.

Although the nature of the work at the LDRF is focused and does not offer a wide range of services, it is critical that the services offered are done well and in a timely fashion. Process and workflow issues require constant attention. The LDRF manager gathers and tracks data on transactions, such as the number of items processed for shelving, the number and type of requests, the number of items re-shelved, and the turn-around time. These statistics will help determine the growth rate of the collection, staffing needed, peaks and valleys of demand, and will gauge the quality and quantity of service. Statistics also help determine the effort required to achieve efficiency and the impact processing changes may have on productivity.

Management and Staffing

In UNL's experience, effective operation of a storage facility requires a capable, competent staff on site. A full-time Library Specialist/LDRF Manager oversees the workflow and handles problems, while a full-time Library Assistant performs more routine tasks, and a half-time Library Assistant provides quality control. The use of temporary staff provided additional help during the first year of operation. Once the original load-in of 400,000 items has been processed, one staff member may be able to handle the ongoing flow of materials into the facility. At UNL, the manager reports to the circulation librarian/facilities manager. However, since this librarian is not often at the LDRF, the manager must handle day-to-day supervision and activities.

Another important factor in maintaining a constant flow of materials through the LDRF is the employment of student assistants. Students did not apply to work at the LDRF as readily as they did at our other library branches, so finding suitable help has been challenging. The LDRF manager discovered that work-study students expected to be able to study some of their shift, and the nature of the work at the LDRF (i.e. production rather than staffing a service point) allowed only for study during work breaks and lunch periods. Parking has also been an issue. The LDRF is not located close to a campus bus stop and a parking permit is required for the few spots in front of the facility. If students don't have a permit, they have to find a place in a residential neighborhood adjacent to the campus and walk to the facility. Finally, the work is physical and repetitive, and there is not much opportunity for socializing. Because of these factors, there has been high turnover among student workers. LDRF staff continue to investigate ways to market the LDRF as an attractive employment site for students.

Requirements and shared duties for staff members at the LDRF include the ability to:

- operate the order picker to shelve trays and retrieve and re-shelve needed items;
- work at least 30% of the time in confined spaces;
- work at heights up to 30 feet for a sustained period;
- work in a temperature- and humidity-controlled area with a temperature ranging between 50-60 degrees and humidity of 35%-50%;
- bend and stretch to reach high and low shelves;
- lift and handle objects up to 50 pounds on a regular basis;
- push books trucks of 200 pounds;
- spend extended periods of time using a computer;
- work with materials that have book dust and possibly book mold;
- and work with cataloging records.

Having a staff member with technical services expertise is important. Despite the clean-up work that took place prior to loading the facility, not all materials have complete bibliographic records, so identifying and correcting such problems is essential to successful retrieval.

Documentation for staff training and operational procedures were developed. These include opening and closing the LDRF, disaster preparedness, emergency situations, service standards, and order picker safety and use. Position descriptions for the manager, assistant, and temporary and student workers were also established.

Interlibrary Loan and Document Delivery

A decision was made early on in the planning to locate an ILL component at the LDRF in order to cut down the amount of time between requests being made and filled. To that end, Ariel and Iliad were installed with a fax machine, photocopier, scanner and sensitizer/desensitizer for circulating materials. As had been the case when we moved items to our temporary storage facilities, the Libraries received requests for materials slated for the LDRF before they were even on the shelves. Facility staff were able to successfully locate and deliver materials even as they were being transported from one location to another during the move.

A delivery van visits the LDRF at least twice a day to bring new materials to be processed and materials to be re-shelved, and to pick up items that have been requested and return other requests. As noted earlier, the Libraries designated pick-up and drop-off areas in each of the three departmental offices where a branch was closed in order to accommodate faculty and staff requests.

Disaster and Evacuation Plan

Because the building is a basic box design with three major areas--the warehouse, garage, and processing room--the evacuation plan is straightforward. The LDRF is connected to the university's enunciator system, so staff are alerted to situations that would require moving to a place of safety. In case of a tornado, staff evacuate to one of the restrooms or the vacuum room. In a fire, staff exit through the main doors, the garage door, or the external door directly adjacent to the garage door. When staff are working in the warehouse, the emergency exit at the far end of the facility is also an option.

A React-Pak™ is located at the facility and the LDRF manager has gone through on-site disaster training. The Libraries stacks maintenance and disaster-planning manager has formalized a disaster plan for that site. Installation of a moisture detection system similar to the one installed at the UNL Sheldon Art Gallery is being considered as a future enhancement to the system. The building is equipped with a dry sprinkler system with the sprinkler heads integrated into the shelving system. The processing room and office area have standard sprinklers in the ceiling.

Pest Management

The facilities manager formed an Integrated pest management team to identify and deal with pests in all of the Libraries buildings. Team members took a formal course designed to recognize and remove the vermin that inhabit libraries, museums, or archives. The team arranged with a local exterminator to place bug traps to discover what insects reside in or near the LDRF. Just before the building opened, a thorough extermination was conducted. The team also recommended installing physical barriers around the garage door and installing electrical bug zappers to eradicate additional flying insects. The LDRF manager trains staff working in the area to bring to his attention materials that may harbor mold, insects or other pests, and consults with the members of the integrated pest management team and the head of the Libraries preservation unit to treat, isolate, or withdraw the volume.

Epilogue: Reflections

Since the completion and occupation of the LDRF in 2005, UNL Libraries continues to refine its operation, both in a physical and technical sense. Included in this epilogue are a number of items and issues that have been dealt with in the intervening months.

By and large, the work of the project management team and working groups ended once the LDRF was occupied. Project management as a planning and implementation strategy proved to be an asset and resulted in a successful

outcome. While the project teams worked well during the construction and initial load-in phase, there were many ongoing issues. The now-defunct project teams were not the appropriate stake holders, so an LDRF issues group was formed, consisting of the LDRF manager, the Libraries collections manager, two technical services staff who had done or supervised much of the preparatory work of the collections moved to the LDRF, and the circulation librarian/facilities manager. These staff members represent the stakeholders in the ongoing activities of the LDRF and continue to use a project management approach to address new issues. The group manages smaller moves such as the transfer of several ceased serial runs from the Geology Library. Another of the group's projects is to work with the Collection Development Committee to determine policies and procedures for subsequent load-ins to the LDRF. The group meets on a monthly or as needed basis, but as the initial load in is completed, it will meet more regularly to identify methods for the continuing movement of materials into the facility.

The original plan was to have the approximately 400,000 volumes moved to the LDRF re-sized and re-bar-coded within two years of the building's completion. The LDRF staff met that goal with time to spare. The plan was to not move any additional pieces in until the initial work was done, but we have found opportunities to move small collections in and have used those moves to experiment with processes for adding up to 40,000 volumes per year.

Mechanically and physically, the building is working exceptionally well. The reduced size of the processing area is adequate for the work done there and should continue to be so even if storage modules are added to the building. The master plan for the university identifies space for two additional modules, and the site and building were designed to accommodate that growth. The building was initially planned to provide the Libraries with approximately twelve years of growth. Realistically, seven to ten years is a more accurate estimate. A good portion of the planning that would be needed for construction of additional space has been done as a result of the initial project. Funding is the main issue that will have to be carefully considered. Although it is clear that storage is a time- and money-saving method of preserving library materials, finding the funds for construction will prove challenging. At this time, there are no plans to pursue state funding to build additional modules.

Since opening of the LDRF in August 2005, there have been numerous visitors, and requests continue for tours of the facility. Groups that have toured include local firefighters, mechanical engineers, University of Kansas, Kansas State University, Nebraska Library Association, Nebraska Educational Media Association, UNL administrators, Lincoln City Libraries, Nebraska State Facility Managers, as well as numerous members of the Libraries staff and other interested individuals. We have discovered that a more structured format for these tours is required. A tour checklist is being developed to provide groups with consistent information and to help the tour guide to be well-

organized and well-prepared. Along with this, we are developing a one-page fact sheet with basic information about the facility, such as when it opened, how many items are there, its capacity, environmental conditions, and accessibility of the materials to users.

Conclusion

The planning and implementation of the University of Nebraska--Lincoln Library Depository Retrieval Facility was a rewarding and highly successful venture. Operating under the auspices of a learning organization, faculty and staff were encouraged to take risks and used project management and strategic planning principles to plan and guide decisions, all critical factors in ensuring a positive outcome to this project. Being involved in an undertaking that was a departure from standard library operations offered staff numerous opportunities to learn new tasks and to take on fresh challenges. Working in an environment of collaboration and cooperation made our goals attainable and, in the end, provided the UNL community with a high-density storage facility of which it can be proud.

Works Cited

- Atkins, Stephanie A. "The Pain in Storage: Work Safety in a High-Density Shelving Facility," *Portal: Libraries and the Academy*:5. (2005).
- Fedderson, Troy. "Book Storage Rises to New Heights," *Scarlet*.15(32). (2005)
- Herzinger, Sandy. "University of Nebraska Library Depository/Retrieval Center: Report and Recommendations." Unpublished report prepared by Sandy Herzinger, June 27, 2003.
- Kohl, David F. "Paper and Digital Repositories in the United States," *LIBER Quarterly: The Journal of European Research Libraries*. 13 (3/4). (2003). Available at <http://liber.library.uu.nl/publish/articles/000038/article.pdf>
- Nitecki, Danuta A. and Curtis L. Kendrick, eds. *Library Off-Site Shelving*. Englewood, Colorado: Libraries Unlimited, 2001.
- Seaman, Scott. "High-Density Off-Site Storage: Document Delivery and Academic Library Research Collections," *Journal of Interlibrary Loan, Document Delivery & Information Supply*.13(3). (2003).

Websites of Organizations Referred to in the Text

- Arizona State University. <http://www.asu.edu/lib/>
- Clark Enersen Partners. <http://www.tcep.net/index.htm>

Dill & Company. <http://www.librarystorage.com/>

Face Consultants. <http://www.face-consultants.com/>

Gryphon Industries. <http://www.gryphonbooktrucks.com/>

Library Design Systems, Inc. <http://www.ldssystems.com/>

Munters: The Humidity Expert. <http://www.munters.com/>

PASCAL: Aurora, Colorado. <http://pascal.uchsc.edu/>

University of Las Vegas. <http://www.library.unlv.edu/>

University of Missouri-Columbia high-density storage facility.
<http://mulibraries.missouri.edu/AccessServices/UMLD/index.html>

University of Nebraska-Lincoln (UNL) Libraries. <http://iris.unl.edu/>

UNL Libraries/Don L. Love Memorial Library and six branch libraries.
<http://www.unl.edu/libr/libr/>

UNL Marvin and Virginia Schmid Law Library.
<http://law.unl.edu/inside.asp?d=law-library>

UNL Library Depository/Retrieval Facility. <http://www.unl.edu/libr/LDRF/>

Washington D.C. Research Library Consortium. <http://www.wrlc.org/>