UNIVERSITY OF ARKANSAS
LIBRARY STORAGE STUDY

Final Report
March 18, 2013

PERRY DEAN ROGERS | PARTNERS ARCHITECTS
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</thead>
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</tbody>
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ACKNOWLEDGMENTS

UNIVERSITY OF ARKANSAS

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STUDY TEAM

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Hayley Bouza, Designer
EXECUTIVE SUMMARY
EXECUTIVE SUMMARY

OVERVIEW
In September of 2012, the University of Arkansas engaged Perry Dean Rogers | Partners Architects (Perry Dean) to develop a library storage study. The study explores the potential of an off-site storage facility to free up space in Mullins Library to be renovated for new programs. The report acknowledges the need for more detailed study of the chosen scheme(s).

SCOPE OF THE STUDY
1. Research the feasibility of constructing a new high-density storage facility for the library collection.
2. Identify space vacated by transfer of collections from Mullins Library to be renovated for new programs.
3. Outline a second phase of work to Mullins Library that would have high impact, described as “Transformational Phase.”
4. Explore the potential of constructing a new building adjacent to Mullins Library.

COLLECTION SIZE
The library collection size was determined through referencing work Perry Dean completed for the Mullins Library Study in 2009 and by working with the collections management staff. Juana Young and Judy Ganson worked with Perry Dean to identify the type of collection eligible for off-site storage. Different high-density storage systems were explored. The collection contains some items that are not suitable for high-density storage, including maps and microforms. The off-site storage options suggested in this report were sized to hold 2,132,525 items in a high-density storage system, which includes an allowance for ten years of growth.

OFF-SITE STORAGE
The site identified by the University of Arkansas for potential use as an off-site storage facility is just south of Martin Luther King Junior Boulevard, between Hill Avenue and South Government Avenue. The site is a five minute drive from the Mullins library. Warehouse buildings used by the University currently occupy a portion of the site. In order to construct a large enough storage facility, an existing one-story brick building will need to be demolished, and the site will need to be levelled.

RETRIEVAL OF MATERIAL
Retrieval of material would start with a student or library user requesting books online using the library catalog. The requested books would then be picked out by the off-site facility staff and delivered to Mullins Library. The design team considered a few types of high-density storage systems to be used off-site. Each system would require slightly different maintenance programs and would be staffed in different ways. The long term operating costs of the facility should be considered when deciding upon the best solution.

STORAGE SYSTEMS
1. High-Bay Fixed Shelving
Materials are stored in fixed shelving units that can be up to 45 feet in height. Books are barcoded, sorted by size and stored in barcoded trays. Book trays are retrieved from the shelving using a forklift picker. The shelving system requires little to no maintenance and has the lowest cost. The system is also flexible; shelving can be adjusted in height to allow for different sized collections. The staff collecting the books will need to operate fork lift pickers.

2. High-Bay Mobile Shelving
High-bay mobile shelving operates in the same way as high-bay fixed shelving, except that the shelving units are mobile for compact storage of materials. Staff can move the shelving units to access the aisles by pressing a button. The book trays are then accessed via forklift picker. High-bay mobile shelving is not recommended for this site. It is more cost effective to build a slightly larger building and use high-bay fixed shelving. The mobile option would also require more maintenance than a fixed system because of the moving parts.

3. Automated Retrieval System (ARS)
Barcoded books are sorted by size and stored
in 24” x 48” bins of varying heights. The bins are stored in storage racks that can be up to 100 feet in height. When an item is requested, a robot brings the appropriate bin to the staff member almost immediately. An ARS used off-site would be beneficial for collections management and ease of accessing materials. Staff would not need to operate fork lift pickers or lift the bins. The books needed are picked out of the bin, which is then returned to its location by the robot. However, the cost of the system is much more than traditional shelving options. The system also requires ongoing maintenance which can add additional costs over time. The advantage of the ease and speed of retrieval must be offset by the increased cost and the fact that once materials are collected, they still need to be driven to the library on a scheduled delivery basis. ARS systems come into their own when the delivery materials are brought to the users in the library within minutes.

ON-SITE STORAGE
The Perry Dean team was asked to investigate the possibility of constructing a new building east of the Music Building and south of Mullins, on a site identified in the 2010 Master Plan. The site can accommodate a four-story building of 36,750 GSF. The building would be large enough to accommodate approximately 1,350,000 volumes within an Automated Retrieval System (ARS). This option provides for the fastest retrieval of materials. Students could retrieve the books they need within 15 minutes. Staff members would access the books from the ARS and then transport them to the main library using the existing underground tunnel. The building could be designed in a way that showcases the advanced technology housed within. However, it is difficult to justify prime campus space being used for a storage facility. This option combines an expensive building skin (being at the heart of the campus) with an expensive storage solution. The design team instead looked at other options for a new building on this site. The building could be used for Special Collections, Performing Arts and Fine Arts, or as a Science Library. Potential program sizes for these have been identified in the report.

RENOVATION OF MULLINS LIBRARY
Off-site storage can accommodate 100% of the collection from Mullins Library. A browsable portion of the collection can be retained within the 1997 addition to Mullins, which is in better condition than the rest of the building. The original older building can be renovated in two phases, or one phase if funding is available.

A preliminary project budget of $16,000,000 was identified by the University for the first phase of renovation work, and a budget of $15,000,000 for the second phase. Perry Dean undertook a conceptual budget estimate in consultation with Faithful & Gould. This preliminary cost estimate shows a need for more funding for the second phase than could actually be achieved. The cost of an off-site building with high-bay fixed shelving is between $9,785,485 to $10,287,178. This cost range reflects shelving estimates from two different vendors. The higher number is more conservative and assumes less efficient storage of oversized volumes and musical scores than could actually be achieved. The estimate for an off-site building with an Automated Retrieval System is much higher at $16,591,128.

The off-site storage facility can hold a portion of the collection in Mullins library and the entire collection from LISA. Mullins library can then be renovated in two phases. The space gained by removing some of the collection will allow for the creation of learning spaces within the library and new programmatic elements. The Phase 2 renovation to Mullins Library will rework the entry sequence into the library by removing the steps at the west side. A new, accessible entrance is thereby created at the first floor level, directly relating to the Main Quad and Student Center.

Future study for a new building south of Mullins Library is recommended. The location is suitable for both library related program or other uses.

CONCLUSIONS / RECOMMENDATIONS
An off-site storage facility utilizing high-bay fixed shelving is the most economical solution long-term. Although it will require more staff members, the upfront cost is less expensive, and there will be little maintenance required over time. The proposed site is well sized to accommodate this type of system with potential for a future expansion that can almost double its size. The cost of an off-site building with high-bay fixed shelving is between $9,785,485 to $10,287,178. This cost range reflects shelving estimates from two different vendors. The higher number is more conservative and assumes less efficient storage of oversized volumes and musical scores than could actually be achieved. The team feels a budget of close to $10,000,000 reasonable at this time. The estimate for an off-site building with an Automated Retrieval System is much higher at $16,591,128.
OFF-SITE STORAGE FACILITY
LIBRARY COLLECTIONS SUMMARY

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Item Width (in)</th>
<th>Item Depth (in)</th>
<th>Item Height (in)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Small Volumes</td>
<td>37,673</td>
<td>1.20</td>
<td>10.00</td>
<td>7.00</td>
</tr>
<tr>
<td>Average Volumes</td>
<td>1,808,310</td>
<td>1.20</td>
<td>10.00</td>
<td>12.00</td>
</tr>
<tr>
<td>Oversize Volumes</td>
<td>37,673</td>
<td>1.20</td>
<td>18.00</td>
<td>30.00</td>
</tr>
<tr>
<td>Government Documents (cataloged)</td>
<td>104,668</td>
<td>0.23</td>
<td>10.00</td>
<td>12.00</td>
</tr>
<tr>
<td>Government Documents (not cataloged)</td>
<td>95,735</td>
<td>0.23</td>
<td>10.00</td>
<td>12.00</td>
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<tr>
<td>Musical Scores</td>
<td>19,901</td>
<td>0.60</td>
<td>12.00</td>
<td>20.00</td>
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<tr>
<td>Bankers Boxes of Manuscripts (processed)</td>
<td>15,153</td>
<td>12.00</td>
<td>12.00</td>
<td>12.00</td>
</tr>
<tr>
<td>Bankers Boxes of Manuscripts (unprocessed)</td>
<td>13,412</td>
<td>12.00</td>
<td>15.00</td>
<td>12.00</td>
</tr>
</tbody>
</table>

The collection information in the table above is for all Library locations, except Law Library holdings, and reflects an estimated count after ten years growth. The table was used to communicate the collections information to the shelving vendors in order to obtain budgetary price quotes. The summary is a simplified version of a larger spreadsheet provided by the collections management staff to Perry Dean. The item dimensions reflect averages for each item type. A more in depth analysis will be required during the planning for a new facility. The selected shelving vendor should be able to assist with counting the collection and correctly sizing the storage system.
The site identified by the University of Arkansas for potential use as an off-site storage facility is just south of Martin Luther King Junior Boulevard, between Hill Avenue and South Government Avenue. The site is a five minute drive from the Mullins library. Warehouse buildings used by the University currently occupy some of the site. The main entry point to the site is from Hill Avenue. Off-site storage will require materials to be delivered from the facility to Mullins Library on a daily basis. The frequency of deliveries has yet to be determined and can be adjusted in response to demand. It is recommended that the loading dock connecting underground to Mullins be updated. This could be completed along with the renovations to Mullins Library recommended in this report.
The proposed use of the site requires the demolition of an existing one-story brick building and a concrete retaining wall. Additional site upgrades needed include new parking, driveway, sidewalks and landscaping. The estimated cost for the demolition and site upgrades is $278,750 (not including markups and contingencies). This study was unable to determine whether the soils are contaminated on the site; a geotechnic report was not available. There are no height restrictions for this site, which is important because the storage facility could be up to 60 feet tall depending on the chosen system.
Identified above is the program needed to support an off-site storage facility. It was determined that oddly sized items such as maps and microforms would not fit well in a high-density storage system, these items of the collection could be accommodated in traditional storage systems such as flat files and microform cabinets. An estimated square footage for these items is shown in the program diagram above, but is not reflected in the proposed plans or cost estimate.

The program includes a large processing area with perimeter shelving, scanner stations, storage room, quarantine area, and recycling. The reading room provides a public space for users to work with materials under supervision.

Suggested program adjacencies are shown on the next page. The processing area is a key component of the facility and is placed adjacent to the loading dock, the high-density storage system, and the preservation/conservation room. The processing space does not need to have access to the reading room. The public should go no further than the reading room.

The high-density storage system requires the largest space in the building. The size of this space varies depending upon the storage system used for the collection. The following pages show two options for storage; high-density fixed shelving and an Automated Retrieval System.
OFF-SITE STORAGE - LAYOUT A: HIGH-BAY FIXED SHELVING

PROCESSING SPACE (2100 SF)
DELIVERY OFFICE (156 SF)
PRESERVATION / CONSERVATION (460 SF)
READING ROOM (550 SF)
STAFF KITCHEN / LOUNGE (247 SF)
OFFICE (156 SF)
OFFICE (156 SF)
LOADING DOCK

SITE BOUNDARY
FUTURE ADDITION
HILL AVENUE

HIGH-BAY FIXED SHELVING
MAX 35' HIGH
(16,200 SF)

DELIVERIES

SCALE: 1/64" = 1'-0"
LAYOUT A: HIGH-BAY FIXED SHELVING

Layout A has a main entry for visitors and staff which opens into the reading room. A second entry point allows for access to the loading dock, which will be used daily for the collection and return of requested materials. The building was priced as a steel frame with insulated metal panels.

The collection is stored in high-bay fixed shelving. The shelving units are 35 feet in height. Books are barcoded, sorted by size and stored in barcoded trays. The book trays are retrieved from the shelving using a forklift picker. The shelving system requires little to no maintenance and has a lower cost than other high-density storage systems. The system is also flexible; shelving can be adjusted in height to allow for different sized collections. The staff collecting the books will need to operate fork lift pickers.

Special collections are separated from the general collection to allow for more stringent temperature and humidity control. The cost of premium HVAC systems would be very high if used throughout the building. An alternative is to use Vertical Lift Systems for storing special collections (see appendix).

The potential for future addition should be considered in the final design of the building. The storage space could be expanded by adding an addition to one side. The existing exterior wall could remain, with openings punched through to allow for movement of equipment and staff throughout the entire space.

COST ESTIMATE:

<table>
<thead>
<tr>
<th>Shelving Type</th>
<th>Building Cost</th>
<th>Shelving Cost</th>
<th>Total Cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>SpaceSaver Shelving</td>
<td>$7,787,178</td>
<td>$1,998,307</td>
<td>$9,785,485</td>
</tr>
<tr>
<td>Montel Shelving</td>
<td>$7,787,178</td>
<td>$2,500,000</td>
<td>$10,287,178</td>
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</tbody>
</table>

Layout A ranges in cost between $9,785,485 to $10,287,178

Note: All shelving estimates are for budgetary purposes only. Shelving cost may vary considerably after an indepth analysis of the collection is undertaken.
OFF-SITE STORAGE - LAYOUT B: AUTOMATED RETRIEVAL SYSTEM

COLLECTION IN ARS
60' HIGH
12,500 SF

PROCESSING SPACE (2100 SF)
DELIVERY OFFICE (156 SF)
PRESERVATION / CONSERVATION DEPARTMENT (460 SF)
READ ROOM (550 SF)
STAFF KITCHEN/LOUNGE (247 SF)
OFFICE (156 SF)
OFFICE (156 SF)
LOADING DOCK
DELIVERIES

SITE BOUNDARY
FUTURE ADDITION
HILL AVENUE

SCALE: 1/64" = 1'-0"
LAYOUT B: AUTOMATED RETRIEVAL SYSTEM

Layout B has the same arrangement of program at the front of the building as Layout A. The difference in plan is the size of the storage system. An Automated Retrieval System (ARS) is used to store the collection. An ARS requires a smaller footprint than fixed shelving. However, the system is taller and must be a long rectangle in plan for cost efficiency; fewer robots are needed with longer aisles. The result is that Layout B is a more expensive building in terms of cost per square foot.

The ARS operates by storing barcoded books by size in 24" x 48" bins of varying heights. The bins are stored in storage racks that can be up to 100 feet in height. In this instance, the system is 50 feet tall. When a book is requested, a robot brings the appropriate bin to the staff member almost immediately. An ARS used off-site would be beneficial for collections management and ease of accessing materials. Staff would not need to operate fork lift pickers or lift the bins. The books needed are picked out of the bin, which is then returned to its location by the robot. The cost of the system is much more than traditional shelving options. The system also requires ongoing maintenance which can add additional costs over time. The advantage of the delivery speed this system offers is diminished when retrieved materials then need to be driven back to Mullins Library. The advantage is lost on patrons who need to wait for the scheduled delivery, regardless of the sophistication of the storage system.

It would be difficult to separate special collections from the general collection using this system. The cost of premium HVAC systems would be very high if used throughout the building. An alternative is to use Vertical Lift Systems (see appendix).

Similar to Layout A, this layout could also accommodate an addition to one side to increase storage space.

COST ESTIMATE:

Dematic Shelving (Formerly HK Systems)

Building Cost: $7,891,128
Shelving Cost: $8,700,000
Total Cost: $16,591,128

Note: All shelving estimates are for budgetary purposes only. Shelving cost may vary considerably after an indepth analysis of the collection is undertaken.
OFF-SITE STORAGE - LAYOUT A: COST ESTIMATE

University of Arkansas
Storage/Library
New Building - option A

<table>
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<th>L</th>
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<th>H</th>
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<th>Wall</th>
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<td>200</td>
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<tr>
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</tr>
<tr>
<td>loading dock doors bumpers</td>
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<td>Structure - Roof dunnage</td>
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<td>Exterior Walls - panel</td>
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<td>Exterior Windows - lobby</td>
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<td>Interiors - office</td>
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<td>Total Trade</td>
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<td>Markups</td>
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<td>Contingencies</td>
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<tr>
<td>Total Construction</td>
<td></td>
<td>$7,787,178</td>
</tr>
</tbody>
</table>

Larger footprint, lower cost per square foot

Assumptions:
- Estimate is for building only, not shelving
- Highly insulated wall and roof system with corrugated skin / Metal Panel
- Premium structural slab (no piles)
- Premium fire protection and high-end HVAC included for a portion of the space, this will require separation of special collections from the general collection
- Interior wall finish - sandwich panels
- Sealed concrete floor
- Office interiors include carpet, acoustic ceiling tiles, painted GWB walls
- Site upgrades include parking, curb-cut, turnaround space for delivery truck at loading dock
- Cost of moving the collection to the facility is excluded
- 5% Escalation included, assumes Summer 2014 construction

Cost Drivers:
- Slab on grade
- Structure (due to height)
- Exterior wall panels (large surface area)
- Roofing
- Mechanical Systems (largest cost driver)
OFF-SITE STORAGE - LAYOUT B: COST ESTIMATE

University of Arkansas
Storage/Library
New Building - option B

<table>
<thead>
<tr>
<th>L</th>
<th>W</th>
<th>H</th>
<th>Area</th>
<th>Perim</th>
<th>Wall</th>
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<tr>
<th>Item</th>
<th>Unit rate</th>
<th>Total</th>
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<td>Interiors - storage</td>
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<tr>
<td>Interiors - office</td>
<td>5000 sf</td>
<td>$15.00</td>
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<tr>
<td>Stairs</td>
<td>ft</td>
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<td>Finishes - storage</td>
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<td>$3.00</td>
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<tr>
<td>Finishes - office</td>
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<tr>
<td>Fire Protection</td>
<td>17500 sf</td>
<td>$6.00</td>
</tr>
<tr>
<td>Fire Protection premium</td>
<td>8750 sf</td>
<td>$15.00</td>
</tr>
<tr>
<td>Electrical</td>
<td>17500 sf</td>
<td>$25.00</td>
</tr>
<tr>
<td>Furnishings</td>
<td>17500 sf</td>
<td>$1.00</td>
</tr>
<tr>
<td>Equipment</td>
<td>17500 sf</td>
<td>$0.50</td>
</tr>
<tr>
<td>Site - strip</td>
<td>1 acr</td>
<td>$20,000.00</td>
</tr>
<tr>
<td>Site - replace</td>
<td>0.75 acr</td>
<td>$345,000.00</td>
</tr>
</tbody>
</table>

Total Trade: $5,219,000

Markups: 20% $5,219,000 $1,043,800
Contingencies: 26% $6,262,800 $1,628,328

Total Construction: $7,891,128

$450.92/SF

Smaller footprint, higher cost per square foot

Assumptions:
• Same as listed for option A

Cost Drivers:
• Same as listed for option A
MULLINS RENOVATION
MULLINS PROPOSED PROGRAM SUMMARY

Off-site storage can accommodate 100% of the collection from Mullins Library. A browsable portion of the collection can be retained within the 1997 addition to Mullins. This portion of Mullins has newer systems, no hazardous materials and a better insulated exterior, whereas the original 1968 portion of Mullins is in dire need of new systems and a better exterior. The 1968 portion of the building can be renovated in two phases, or one phase if funding is available.

A preliminary project budget of $16,000,000 was identified by the University for the first phase of renovation work, and a budget of $15,000,000 for the second phase. The preliminary cost estimate suggests these two budgets should be switched, with the first phase needing $1.5m more than the second.

The first phase includes light renovation of 69,260 GSF of space. The second phase is a transformational renovation of 36,650 GSF. The diagram at right illustrates a summary of the space needs identified in the 2009 Perry Dean Study for Mullins Library. The proposed renovations are for a total of 105,910 GSF. This is approximately 63,546 NSF at 60% efficiency. Further study and space planning is needed to identify which program elements should have top priority to move into the renovated space.
MULLINS RENOVATION: PROPOSED PHASING

Phase 1: Interior Renovation
Phase 1 proposes renovating space vacated by the transfer of collections to the new off-site storage facility. It includes updates to Special Collections spaces on the first floor, with a new processing space, reading room, and digitizing room. The loading dock connecting to Mullins Library at the first floor level would also be remodeled during this phase. There are no changes to the second floor. The third and fourth floor include light renovation to provide space for computer workstations and study areas. The estimate assumes new ceilings, lighting, power distribution and HVAC distribution. Central systems like air chillers, air handlers, switch panels, and vertical duct shafts are excluded.

Phase 2: Transformational Piece
Phase 2 allows for a dramatic remodeling of the exterior and entrance sequence and includes the entire west facing facade. New stairs, elevators, and restrooms are added on each floor allowing the west facade to be re clad with curtainwall at the first and second floors. New windows replace the stone paneling on the third and fourth floor bays to further enhance the visual connections from Mullins to the exterior. The front steps on the west side are removed to allow a new entry to the building at the first floor level. The entry opens onto a grand stair which leads to the second floor. The entry is flanked by a cafe on one side and an event space on the other. These spaces could have the ability to expand outdoors onto the quad between Mullins Library and the Arkansas Union building.

BUDGET VERSUS COST ESTIMATE

University Budget:
- Project Budget: $16,000,000
- Construction Budget: $12,320,000
- ($16,000,000 x 0.77)

Cost Estimate:
- Renovation Size: 69,260 GSF
- Construction Cost: $11,202,219
- Project Cost: $14,450,862
- ($11,202,219 x 1.30)

University Budget:
- Project Budget: $15,000,000
- Construction Budget: $11,550,000
- ($15,000,000 x 0.77)

Cost Estimate:
- Renovation Size: 36,650 GSF
- Construction Cost: $12,938,126
- Project Cost: $16,819,563
- ($12,938,126 x 1.30)
PROPOSED PLAN: LEVEL 01

Phase 1: 21,360 GSF
Phase 2: 8,945 GSF

EXISTING TO REMAIN

SPECIAL COLLECTIONS
READING ROOM
STAFF SPACE
DIGITIZING
PROCESSING

PHASE 1

New Egress Stair
New Stair
New Elevators
New Egress Stair

PHASE 2

EVENT SPACE
CAFÉ
RESTROOMS
CAFE SEATING / OPEN STUDY

SITE CHANGES

Renovate Loading Dock
Demolish Front Steps

CURTAINWALL

NEW ENTRY
NEW EGRESS STAIR
NEW ELEVATORS
NEW STAIR
PROPOSED PLAN: LEVEL 02

EXISTING TO REMAIN

New Egress Stair
New Stair
New Elevators
New Egress Stair

NEW RENOVATED SPACE

PHASE 2

PHASE 2

RESTROOMS

Phase 2: 8,945 GSF
PROPOSED PLAN: LEVEL 04

EXISTING TO REMAIN

NEW RENOVATED SPACE

PHASE 1

New Egress Stair
New Elevators
New Egress Stair

RESTROOMS

PHASE 2

Replace with Windows

Phase 1: 23,950 GSF
Phase 2: 9,380 GSF
### MULLINS RENOVATION: PHASE 1 INTERIOR

**University of Arkansas**  
Storage/Library  
Existing Building Interior Renovation

#### Assumptions:
- Central HVAC and mechanical systems to remain, new horizontal distribution
- New sprinkler system
- Use of existing electric gear and equipment
- New electrical power and data distribution included
- No roof work; air handlers already replaced
- No code upgrades; elevators, stairs, restrooms to remain
- 75% Open Study space, 25% Enclosed Office space
- Excludes flatscreens, smartboards, etc. and associated wiring
- Includes remodeling of loading dock
- Escalation assumed for Summer 2014 construction

<table>
<thead>
<tr>
<th>Phase 1</th>
<th>Unit rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demolition 69260 sf</td>
<td>$13.00</td>
<td>$900,380</td>
</tr>
<tr>
<td>Structure - misc penetrations/reframe 69260 sf</td>
<td>$1.00</td>
<td>$69,260</td>
</tr>
<tr>
<td>Roofing - no work 69260 sf</td>
<td>$0.00</td>
<td>$0</td>
</tr>
<tr>
<td>Interiors - open 75% 51945 sf</td>
<td>$15.00</td>
<td>$779,175</td>
</tr>
<tr>
<td>Interiors - office 25% 17315 sf</td>
<td>$35.00</td>
<td>$606,025</td>
</tr>
<tr>
<td>Stairs - no code upgrades - 0 ft 69260 sf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Finishes - open 75% 51945 ft</td>
<td>$10.00</td>
<td>$519,450</td>
</tr>
<tr>
<td>Finishes - office 25% 17315 ft</td>
<td>$15.00</td>
<td>$259,725</td>
</tr>
<tr>
<td>Plumbing - minor work 69260 sf</td>
<td>$0.50</td>
<td>$34,630</td>
</tr>
<tr>
<td>HVAC - fit out space 69260 sf</td>
<td>$30.00</td>
<td>$2,077,800</td>
</tr>
<tr>
<td>Fire Protection 69260 sf</td>
<td>$4.00</td>
<td>$277,040</td>
</tr>
<tr>
<td>Electrical/Teldata etc. 69260 sf</td>
<td>$25.00</td>
<td>$1,731,500</td>
</tr>
<tr>
<td>Furnishings 69260 sf</td>
<td>$1.00</td>
<td>$69,260</td>
</tr>
<tr>
<td>Equipment 69260 sf</td>
<td>$0.50</td>
<td>$34,630</td>
</tr>
<tr>
<td>Site - remodel loading dock 1 ls</td>
<td>$50,000.00</td>
<td>$50,000</td>
</tr>
</tbody>
</table>

**Total Trade**  
$7,408,875

**Markups 20%**  
$7,408,875  
$1,481,775

**Contingencies 26%**  
$8,890,650  
$2,311,569

**Total Construction**  
$11,202,219  
$161.74 /SF
MULLINS RENOVATION: PHASE 2 TRANSFORMATIONAL PIECE

University of Arkansas
Storage/Library
Existing Building Transformation

Phase 2

<table>
<thead>
<tr>
<th>Trade</th>
<th>Unit rate</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Demolition</td>
<td>36650 sf</td>
<td>$13.00</td>
</tr>
<tr>
<td>Structure - misc penetrations/</td>
<td>36650 sf</td>
<td>$1.00</td>
</tr>
<tr>
<td>reframe</td>
<td></td>
<td>$36,650</td>
</tr>
<tr>
<td>Roofing - reframe elev</td>
<td>1 ls</td>
<td>$10,000.00</td>
</tr>
<tr>
<td>Interiors - open 75%</td>
<td>27487.5 sf</td>
<td>$15.00</td>
</tr>
<tr>
<td>Interiors - office 25%</td>
<td>9162.5 sf</td>
<td>$35.00</td>
</tr>
<tr>
<td>Finishes - open 75%</td>
<td>27487.5 sf</td>
<td>$10.00</td>
</tr>
<tr>
<td>Finishes - office 25%</td>
<td>9162.5 sf</td>
<td>$15.00</td>
</tr>
<tr>
<td>Plumbing - minor work</td>
<td>36650 sf</td>
<td>$0.50</td>
</tr>
<tr>
<td>HVAC - fit out space</td>
<td>36650 sf</td>
<td>$30.00</td>
</tr>
<tr>
<td>Fire Protection</td>
<td>36650 sf</td>
<td>$4.00</td>
</tr>
<tr>
<td>Electrical/Teldata etc.</td>
<td>36650 sf</td>
<td>$25.00</td>
</tr>
<tr>
<td>Furnishings</td>
<td>36650 sf</td>
<td>$1.00</td>
</tr>
<tr>
<td>Equipment - café (warming)</td>
<td>1 ls</td>
<td>$100,000.00</td>
</tr>
<tr>
<td>Double height event space</td>
<td>4000 sf</td>
<td>$75.00</td>
</tr>
<tr>
<td>Grand stair - 1 level</td>
<td>1 ls</td>
<td>$125,000.00</td>
</tr>
<tr>
<td>New elevators 4 stop (incl arch/str)</td>
<td>2 ea</td>
<td>$300,000.00</td>
</tr>
<tr>
<td>New egress stairs (incl arch/str)</td>
<td>8 ft</td>
<td>$35,000.00</td>
</tr>
<tr>
<td>New Bathrooms</td>
<td>3000 sf</td>
<td>$300.00</td>
</tr>
<tr>
<td>Site - Demolish steps/adjust entry</td>
<td>29017 sf</td>
<td>$25.00</td>
</tr>
<tr>
<td>Site - Demolish adjust ext walls 1+2</td>
<td>8250 sf</td>
<td>$100.00</td>
</tr>
<tr>
<td>Site - Exterior envelope repl. Level 3/4</td>
<td>7710 sf</td>
<td>$80.00</td>
</tr>
</tbody>
</table>

Total Trade: $8,357,963

Markups: 20% $8,357,963 $1,671,593
Contingencies: 29% $10,029,555 $2,908,571

Total Construction: $12,938,126
$353.02/SF
BUILDING FOOTPRINT CONFORMS TO 2010 MASTER PLAN
NEW BUILDING

Aerial of site with Mullins Library at top

View of site from south, with Mullins Library beyond

TOTAL: 36,750 GSF  (22,050 NSF at 60% net to gross)
## NEW BUILDING: POTENTIAL PROGRAM

### SPECIAL COLLECTIONS PROGRAM

<table>
<thead>
<tr>
<th>Area</th>
<th>SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>805 sf</td>
</tr>
<tr>
<td>Support Spaces</td>
<td>1,810 sf</td>
</tr>
<tr>
<td>User Services</td>
<td>495 sf</td>
</tr>
<tr>
<td>University Archives</td>
<td>170 sf</td>
</tr>
<tr>
<td>Research Reading Room</td>
<td>2,585 sf</td>
</tr>
<tr>
<td>Manuscripts &amp; Archives</td>
<td>6,040 sf</td>
</tr>
<tr>
<td>Index Arkansas</td>
<td>420 sf</td>
</tr>
<tr>
<td>Architectural Collection Reading Room</td>
<td>1,670 sf</td>
</tr>
<tr>
<td>Current LISA Staff</td>
<td>1,310 sf</td>
</tr>
<tr>
<td>Special Collections Holdings (Compact Shelving)</td>
<td>8,240 sf</td>
</tr>
</tbody>
</table>

_Pryor Center to remain in Mullins_

TOTAL NSF: 23,545 sf
TOTAL GSF (NSF x 1.666): 39,225 sf

### SCIENCE LIBRARY PROGRAM

### Readers
(60 Readers)

<table>
<thead>
<tr>
<th>Area</th>
<th>SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>4x6 Tables</td>
<td>2,400 sf</td>
</tr>
<tr>
<td>Single Carrel</td>
<td>350 sf</td>
</tr>
<tr>
<td>Lounge Chair</td>
<td>300 sf</td>
</tr>
<tr>
<td>Workstations</td>
<td></td>
</tr>
<tr>
<td>Computer Stations</td>
<td>1,750 sf</td>
</tr>
<tr>
<td>Printer Station</td>
<td>35 sf</td>
</tr>
<tr>
<td>Scanner Station</td>
<td>35 sf</td>
</tr>
<tr>
<td>Photocopier</td>
<td>35 sf</td>
</tr>
<tr>
<td><strong>Staff Spaces</strong></td>
<td></td>
</tr>
<tr>
<td>Service Desk</td>
<td>200 sf</td>
</tr>
<tr>
<td>Librarian Office</td>
<td>2,000 sf</td>
</tr>
<tr>
<td>Supervisor Office</td>
<td>150 sf</td>
</tr>
<tr>
<td>Support Staff Office (4 Staff)</td>
<td>400 sf</td>
</tr>
<tr>
<td>Graduate Assistant Offices (4 GAs)</td>
<td>200 sf</td>
</tr>
<tr>
<td>Student Employee (4) Workspace</td>
<td>200 sf</td>
</tr>
<tr>
<td><strong>Study / Meeting</strong></td>
<td></td>
</tr>
<tr>
<td>Meeting Room</td>
<td>400 sf</td>
</tr>
<tr>
<td>Training Room - 30 Person</td>
<td>3,000 sf</td>
</tr>
<tr>
<td>Study Carrels</td>
<td>450 sf</td>
</tr>
<tr>
<td>Group Study Room - 6 Person</td>
<td>400 sf</td>
</tr>
</tbody>
</table>

### Collection
Reference Ready Collection 800 Volumes (7 DFS) 175 sf

### Support Space

<table>
<thead>
<tr>
<th>Area</th>
<th>SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Storage Closet</td>
<td>25 sf</td>
</tr>
<tr>
<td>Work/Break Room/Sink, Refrigerator</td>
<td>150 sf</td>
</tr>
<tr>
<td>Restrooms</td>
<td>400 sf</td>
</tr>
</tbody>
</table>

TOTAL: 13,055 sf
TOTAL GSF: 21,750 sf

### PERFORMING ARTS AND MEDIA PROGRAM

<table>
<thead>
<tr>
<th>Area</th>
<th>SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Multimedia Resource Center (MMRC)</td>
<td>1,555 sf</td>
</tr>
<tr>
<td>Performing Arts &amp; Media</td>
<td>1,825 sf</td>
</tr>
<tr>
<td>Distance Education</td>
<td>150 sf</td>
</tr>
<tr>
<td>Shared Spaces</td>
<td>700 sf</td>
</tr>
<tr>
<td>Reader Accommodations</td>
<td>1,560 sf</td>
</tr>
</tbody>
</table>

TOTAL: 5,790 sf
TOTAL GSF: 9,646 sf

### FINE ARTS PROGRAM

<table>
<thead>
<tr>
<th>Area</th>
<th>SF</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fine Arts (Materials from Fine Arts Center)</td>
<td>4,000 sf</td>
</tr>
</tbody>
</table>

TOTAL: 4,000 sf
TOTAL GSF: 6,664 sf
APPENDIX

01 SPACESAVER PROPOSED OFF-SITE FIXED SHELVING LAYOUT

02 BUILDING CONSTRUCTION AND TORNADO CONSIDERATIONS

03 ADDITIONAL STORAGE OPTIONS

04 MULLINS LIBRARY PROPOSED PROGRAM FROM PERRY DEAN 2009 STUDY

05 MULLINS CIRCULATION BY CALL NUMBER

06 PERRY DEAN 2009 MULLINS STUDY OVERVIEW

07 ON-SITE ARS SUMMARY
# Spacemaker Proposed Off-Site Fixed Shelving Plan

## Collection
**High Density Storage System**

(20,800 SF)

---

### Site Boundary

### Entry

- Reading Room (550 SF)
- Office (156 SF)
- Office (156 SF)

### Processing Space

(2100 SF)

### Loading Dock

- Delivery Office (156 SF)

### Staff Kitchen/Lounge

(247 SF)

### Preservation/Conservation

(460 SF)

---

### Dimensions

150’-0”

108’-0”
SPACESAVER PROPOSED OFF-SITE FIXED SHELVING ELEVATIONS

FRONT ELEVATION

BACK-TO-BACK SIDE ELEVATION

STANDARD STATIC ELEVATIONS
The study was unable to identify a price for tilt-up construction. Should this be of interest, a Construction Manager with experience in tilt-up construction should be quickly able to provide a budget cost based on this report.

Some important parameters of tilt-up construction to consider are as follows:

- Special cranes and spreader bars are required for panels over 30 feet in height. It is generally better to have the panels all nearly the same height and less than 30 feet.
- The crane needs to be able to access the job site. Relatively flat terrain is needed to allow the crane operation. Any power lines, ditches, railroad tracks, or other obstructions will limit crane operation. Other buildings very close to where panels must be placed can affect the construction process.
- The roof structure acts as a diaphragm to horizontally support the wall at the top, and the curb on the footing supports it laterally at the bottom. The panels are generally not connected together to allow for expansion and contraction without cracking. The panels are only positively connected to the roof at their centers near the top.

Source: [http://www.tilt-up.org/faq/general.php](http://www.tilt-up.org/faq/general.php)
OFF-SITE STORAGE - TORNADO CONSIDERATIONS

<table>
<thead>
<tr>
<th>EF RATING</th>
<th>3 SECOND GUST (MPH)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>65-85</td>
</tr>
<tr>
<td>1</td>
<td>86-110</td>
</tr>
<tr>
<td>2</td>
<td>111-135</td>
</tr>
<tr>
<td>3</td>
<td>136-165</td>
</tr>
<tr>
<td>4</td>
<td>166-200</td>
</tr>
<tr>
<td>5</td>
<td>OVER 200</td>
</tr>
</tbody>
</table>

The EF Scale is used to assign a tornado a 'rating' based on estimated wind speeds and related damage. When tornado-related damage is surveyed, it is compared to a list of Damage Indicators (DIs) and Degrees of Damage (DoD) which help estimate better the range of wind speeds the tornado likely produced. From that, a rating (from EF0 to EF5) is assigned.

The EF Scale was revised from the original Fujita Scale to reflect better examinations of tornado damage surveys so as to align wind speeds more closely with associated storm damage. The new scale has to do with how most structures are designed.


OFF-SITE STORAGE - ADDITIONAL STORAGE OPTIONS

VERTICAL LIFT SYSTEM

A Vertical Lift System could be used to store Special Collections. The cost of HVAC systems will be very high if used across the entire storage facility. By isolating the Special Collections in Vertical Lift Modules, they will be protected, and the entire building does not need to have premium HVAC.

The cost of HVAC versus the cost of Vertical Lift Modules would need to be determined.

Vertical Lift System Overview:
Kardex Remstar Shuttle XP

The Shuttle XP is a solution for high density storage. It is a fully automated and intelligent product. It simultaneously measures, weighs and allocates products to be stored in the most space efficient location. The Shuttle XP is a dynamic vertical lift system with almost unrestricted flexibility in terms of height with units available up to 100 feet high. One unit can carry a gross load of 60 tons or more.

Benefits:

Space Savings – The Shuttle XP has an extremely high capacity within the smallest of footprints. Floor space savings of up to 80% will be typical when compared to conventional storage products.

Time Savings – The system delivers the selected tray to the access position in a matter of seconds.

Security – The contents of the Shuttle XP are protected against dust and unauthorized access. The units have internal shutter doors and additional options include PIN access control, fire protection and environmental temperature control.

HIGH-BAY MOBILE SHELVING:

Mobile storage is more space efficient than fixed shelving. Staff can move the shelving units to access the aisles by pressing a button. Book trays are then accessed via forklift picker. Shelving units can be built up to 45 feet in height.
MULLINS PROPOSED PROGRAM
MULTIMEDIA RESOURCE CENTER / PERFORMING ARTS AND MEDIA: 4,595 SF

MULTI MEDIA RESOURCE CENTER (MMRC)
- OPERATIONS MANAGER OFFICE (200)
- STORAGE (100)
- PRODUCTION AREA (140)
- 3D AREA (105)
- 4 @ 150 sf
- 4 @ 35 sf
- OFFICE (600)
- SCANNING AREA (200)
- DEVELOPMENT AREA (210)

DISTANCE EDUCATION
- TEAM ROOM (SEE READER ACCOMMODATIONS)
- PRESENTATION ROOM (SEE READER ACCOMMODATIONS)
- OFFICE (150)

PERFORMING ARTS & MEDIA
- SUPERVISOR OFFICE (150)
- STAFF OFFICE (150)
- STAFF OFFICE (150)
- PRINTER/COPIER (60)
- LIBRARIAN OFFICE (200)
- PROCESSING AREA (150)
- USER BOOTH (600)
- WORKSTATIONS (60)
- STORAGE (100)
- SHELVING (15)
- PRESENTATION ROOM (SEE READER ACCOMMODATIONS)

SHARED SPACES
- BATHROOM (600)
- 2 @ 200 sf
- RECEPTION AREA + SERVICE DESK (300)
MULLINS PROPOSED PROGRAM
COLLECTIONS MANAGEMENT SERVICES AND SYSTEMS: 13,410 SF

COLLECTIONS MGMT
DIRECTOR'S OFFICE (250)

DIGITAL INITIATIVES LIBRARIAN OFFICE (150)

HEAD OF CAT. ACQUIST. DEPT./ SERIALS OFFICE (250)

WORKSTATIONS (420)

BOOK TRUCKS (115)

STUDENT WORKSTATIONS (60)

WORK AREA (30)

SYSTEMS
HEAD OF SYSTEM OFFICE (200)

OFFICES (450)

SYSTEM EQUIPMENT ROOM (200)

DIVISION SPACE
MEETING ROOM (200)

CATALOGUING REFERENCE BOOKSHELVES (75)

DEPARTMENTAL WORK SPACE (60)

SHELFIST CABINET (10)

DIVISION COPIER AREA
COPIER ROOM (150)

DEPT. SUPPLIES CLOSET (50)

SINK & COUNTER (25)

WEB SERVICES
DEPT. HEAD OFFICE (250)

OFFICES (100)

PRESERVATION
DEPT. HEAD OFFICE (250)

OFFICES (100)

PRESERVATION WOREROOM (900)

PRESERVATION LIBRARIAN OFFICE (150)

BINDERY
HEAD OF BINDERY OFFICE (150)

WORK AREA (120)

BOOK TRUCKS (150)

RECEIVING ROOM (280)

WORKSTATIONS (240)

DATABASE MAINTENANCE / MUSIC CATALOGUING UNIT
HEAD OF DATABASE MAINTENANCE/ MUSIC OFFICE (200)

LIBRARY SUPERVISOR OFFICE (60)

BOOK TRUCKS (60)

SHELVING (60)

WORKSTATIONS (180)

12 @ 15 sf

6 @ 15 sf

10 @ 15 sf

4 @ 15 sf

DATABASE MAINTENANCE / MUSIC CATALOGUING UNIT
HEAD OF DATABASE MAINTENANCE/ MUSIC OFFICE (200)

LIBRARY SUPERVISOR OFFICE (150)

BOOK TRUCKS (60)

SHELVING (60)

WORKSTATIONS (180)

12 @ 15 sf

6 @ 15 sf

4 @ 15 sf

CATALOGUING ACQUISITIONS
LIBRARY SUPERVISOR OFFICE (150)

SHELVING (30)

2 @ 15 sf

SYSTEMS
HEAD OF SYSTEM OFFICE (200)

OFFICES (450)

SYSTEM EQUIPMENT ROOM (200)

DIVISION SPACE
MEETING ROOM (200)

CATALOGUING REFERENCE BOOKSHELVES (75)

DEPARTMENTAL WORK SPACE (60)

SHELFIST CABINET (10)

DIVISION COPIER AREA
COPIER ROOM (150)

DEPT. SUPPLIES CLOSET (50)

SINK & COUNTER (25)

WEB SERVICES
DEPT. HEAD OFFICE (250)

OFFICES (100)

PRESERVATION
DEPT. HEAD OFFICE (250)

OFFICES (100)

PRESERVATION WOREROOM (900)

PRESERVATION LIBRARIAN OFFICE (150)

BINDERY
HEAD OF BINDERY OFFICE (150)

WORK AREA (120)

BOOK TRUCKS (150)

RECEIVING ROOM (280)

WORKSTATIONS (240)

DATABASE MAINTENANCE / MUSIC CATALOGUING UNIT
HEAD OF DATABASE MAINTENANCE/ MUSIC OFFICE (200)

LIBRARY SUPERVISOR OFFICE (60)

BOOK TRUCKS (60)

SHELVING (60)

WORKSTATIONS (180)

12 @ 15 sf

6 @ 15 sf

10 @ 15 sf

4 @ 15 sf

DATABASE MAINTENANCE / MUSIC CATALOGUING UNIT
HEAD OF DATABASE MAINTENANCE/ MUSIC OFFICE (200)

LIBRARY SUPERVISOR OFFICE (150)

BOOK TRUCKS (60)

SHELVING (60)

WORKSTATIONS (180)

12 @ 15 sf

6 @ 15 sf

4 @ 15 sf

CATALOGUING ACQUISITIONS
LIBRARY SUPERVISOR OFFICE (150)

SHELVING (30)

2 @ 15 sf

SYSTEMS
HEAD OF SYSTEM OFFICE (200)

OFFICES (450)

SYSTEM EQUIPMENT ROOM (200)

DIVISION SPACE
MEETING ROOM (200)

CATALOGUING REFERENCE BOOKSHELVES (75)

DEPARTMENTAL WORK SPACE (60)

SHELFIST CABINET (10)
MULLINS PROPOSED PROGRAM
READER ACCOMMODATIONS: 61,560 SF - 2,047 READERS

SINGLE READERS 17,100 sq ft

ARCHIVES READING RM 2,000 sq ft

PAIRS OF READERS 800 sq ft

PERFORMING ARTS & MULTI-MEDIA 1,560 sq ft

UNIVERSITY OF ARKANSAS - LIBRARY STORAGE STUDY
FINAL REPORT
MULLINS PROPOSED PROGRAM
STAFF SPACES: 21,440 SF

DEAN OF UNIVERSITY LIBRARIES
- Dean's Office (400)
- Copier Room (150)
- Kitchen (60)
- Dean's Bathroom (50)
- Admin. Asst. Workstation (100)
- Student Assistant (60)
- Storage Room (150)
- Waiting Area (100)
- Supplies Closet (10)

PUBLIC RELATIONS
- Office/Workroom (400)
- Workstations (90)
- Storage (100)

DEVELOPMENT
- Director's Office (100)
- Receptionist Area (100)
- Waiting Area (100)
- Storage Closet (50)

ADMINISTRATION SERVICES
- Assoc. Dean & Director Office (150)
- Human Resources
  - Head of HR Office (250)
  - Meeting Room (250)
  - Inactive File Room (120)
  - Workstations (160)
  - 2 @ 60 sf

BUDGETING OFFICE
- Head of Accounts Office (200)
- Officce (150)
- Work Area (120)
- Workstations (120)
  - 1 @ 100 sf; 1 @ 60 sf

FACILITIES MANAGEMENT
- Meeting Area (100)
- Work Area (120)
- Workstations (120)
  - 2 @ 60 sf

SHIPPING & RECEIVING
- Workstations (120)
  - 2 @ 60 sf
- Surplus Room (180)
- Furniture Staging & Storage (280)
- Freight Elevator (100)
- Breakdown/Receiving Area/ Mail Area (100)

2,630 sq ft
3,820 sq ft
<table>
<thead>
<tr>
<th>Call Number</th>
<th># of shelves</th>
<th>circulation FY12</th>
<th>internal use FY12</th>
<th>interlibrary loan FY12</th>
<th>total uses (circ + iuse + ill)</th>
<th>storage FY12</th>
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<tr>
<td>A-AZ</td>
<td>1090</td>
<td>133</td>
<td>560</td>
<td>103</td>
<td>796</td>
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<tr>
<td>B-BD</td>
<td>755</td>
<td>1132</td>
<td>375</td>
<td>106</td>
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<td>15</td>
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<td>BF</td>
<td>724</td>
<td>826</td>
<td>347</td>
<td>288</td>
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<td>23</td>
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<td>17</td>
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<td>110</td>
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<td>150</td>
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<td>BR</td>
<td>158</td>
<td>209</td>
<td>148</td>
<td>9</td>
<td>366</td>
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<td>BS-BT</td>
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<td>247</td>
<td>136</td>
<td>17</td>
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<td>78</td>
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<td>428</td>
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<td>69</td>
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<tr>
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<td>2507</td>
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<td>323</td>
<td>737</td>
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<td>F 1-430</td>
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<td>89</td>
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<td>39</td>
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<tr>
<td>H</td>
<td>273</td>
<td>239</td>
<td>70</td>
<td>55</td>
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<td>2261</td>
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<td>563</td>
<td>730</td>
<td>253</td>
<td>182</td>
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<td>HQ</td>
<td>372</td>
<td>1065</td>
<td>464</td>
<td>137</td>
<td>1666</td>
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<td>HS - HV</td>
<td>661</td>
<td>997</td>
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<td>136</td>
<td>102</td>
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<td>KF 3990 - KF 9999</td>
<td>43</td>
<td>85</td>
<td>22</td>
<td></td>
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<td>KFA3600+</td>
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<td>L - LT</td>
<td>1808</td>
<td>1837</td>
<td>1705</td>
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<td>LRC (all LRC call numbers)</td>
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<td>884</td>
<td>534</td>
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<td>100</td>
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<td>25</td>
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<td>N - NX</td>
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<td>470</td>
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<td>76</td>
<td>866</td>
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<td>P</td>
<td>209</td>
<td>431</td>
<td>146</td>
<td>67</td>
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<td>PA</td>
<td>237</td>
<td>498</td>
<td>157</td>
<td>20</td>
<td>675</td>
<td>0</td>
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<td>PB - PM</td>
<td>686</td>
<td>1373</td>
<td>509</td>
<td>109</td>
<td>1991</td>
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<td>PN</td>
<td>958</td>
<td>1470</td>
<td>790</td>
<td>153</td>
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<td>15</td>
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<td>PQ 1-3999</td>
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<td>606</td>
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<td>66</td>
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<td>5</td>
<td>97</td>
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<td>PR</td>
<td>PS</td>
<td>PT</td>
<td>QA</td>
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<tr>
<td>Count</td>
<td>419</td>
<td>445</td>
<td>186</td>
<td>57</td>
<td>688</td>
<td>0</td>
</tr>
</tbody>
</table>
The floor plan above shows the rate of circulation of books in relation to where they are located in the library. The graphic at right shows how often each group of call numbers were checked out during the Fiscal Year (FY) of 2012.

Level 01 holds the books that are circulated the most. Call numbers N-NX were checked out over 6,000 times during FY 2012, and M-MT were checked out over 3,500 times.
Level 02 does not contain any of the circulating collection.
The floor plan above shows the rate of circulation of books in relation to where they are located in the library. The graphic at right shows how often each group of call numbers were checked out during the Fiscal Year (FY) of 2012. The call numbers that were circulated the most times dictate the color code designation of the group of shelving in plan.

The most frequently circulated call numbers on this level are D-DR, E, HA-HF, and LB-LZ.
The floor plan above shows the rate of circulation of books in relation to where they are located in the library. The graphic at right shows how often each group of call numbers were checked out during the Fiscal Year (FY) of 2012. The call numbers that were circulated the most times dictate the color code designation of the group of shelving in plan.

The most frequently circulated call numbers on this level are PN and PS.
PERRY DEAN 2009 STUDY - PLANNING RECOMMENDATIONS: SECOND FLOOR
PERRY DEAN 2009 STUDY - PLANNING RECOMMENDATIONS: ROOF

- New Elevator Overrun
- Existing Air Handler
- New Air Handlers Location
- New Skylights (Typical)
- Atrium Roof
PERRY DEAN 2009 STUDY - DESIGN: RENDERINGS

Western Facade + Quad Concept Rendering

Central Atrium Concept Rendering
### ON-SITE STORAGE FACILITY: ESTIMATED CAPACITY OF ARS

#### Result Summary Space Capacity 1.5” Volume Thickness

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Long Space</th>
<th>Short Space</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Aisles</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Number of Bins</td>
<td>9,200</td>
<td>6,992</td>
</tr>
<tr>
<td>Estimated Number of Linear Feet of Storage Provided</td>
<td>92,000</td>
<td>69,920</td>
</tr>
<tr>
<td>Estimated Volume Capacity (Total 1,338,241)</td>
<td>765,416</td>
<td>581,825</td>
</tr>
<tr>
<td>Software</td>
<td>HK DMS to Innovative</td>
<td>HK DMS to Innovative</td>
</tr>
</tbody>
</table>

Note that the system is relatively sensitive to the thickness of the volumes and verification of the thickness is recommended to enable the University to select the best design concept.

The following space analysis details the space required for the base as well as escalated collections. All spaces are 54’ wide.

#### Result Summary Space Required 1.5” Volume Thickness

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Base Collection</th>
<th>1.5M Volumes</th>
<th>1.75M Volumes</th>
<th>2.0M Volumes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of Aisles</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Number of Bins</td>
<td>16,560</td>
<td>18,032</td>
<td>21,344</td>
<td>24,288</td>
</tr>
<tr>
<td>System Length</td>
<td>125’</td>
<td>132’</td>
<td>153’</td>
<td>174’</td>
</tr>
<tr>
<td>Software</td>
<td>HK DMS to Innovative</td>
<td>HK DMS to Innovative</td>
<td>HK DMS to Innovative</td>
<td>HK DMS to Innovative</td>
</tr>
</tbody>
</table>

#### Result Summary Space Required 1.25” Volume Thickness

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Base Collection</th>
<th>1.5M Volumes</th>
<th>1.75M Volumes</th>
<th>2.0M Volumes</th>
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</thead>
<tbody>
<tr>
<td>Number of Aisles</td>
<td>4</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Number of Bins</td>
<td>13,984</td>
<td>15,456</td>
<td>18,032</td>
<td>20,608</td>
</tr>
<tr>
<td>System Length</td>
<td>106’</td>
<td>116’</td>
<td>132’</td>
<td>148’</td>
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<tr>
<td>Software</td>
<td>HK DMS to Innovative</td>
<td>HK DMS to Innovative</td>
<td>HK DMS to Innovative</td>
<td>HK DMS to Innovative</td>
</tr>
</tbody>
</table>

Based on the analysis by Dematic, a capacity of 1.3 - 1.5 million volumes (depending on volume thickness) can be assumed for a new building adjacent to the Mullins Library. This number of volumes would accommodate almost all of the collection in Mullins, but would not accommodate the collection in LISA. However, it is unlikely that the entire collection would be put in storage, which would allow for more space in the ARS for LISA materials. Additionally, the basement level of Mullins could incorporate more compact shelving.

Advantages of an on-site ARS:

- Collection remains part of the Mullins Library
- Quick retrieval of items - connection to Mullins library via underground tunnel would allow for retrieval of items in 10 - 20 minutes.
- Collections in ALS take up 1/7 of the space of collections in traditional open shelving

Disadvantages of an on-site ARS

- Cost - much more expensive than off-site storage
- Learning curve for staff operating the system
- Added cost for hardware and software support

Institutions with Automated Retrieval Systems:

- Chicago State University
- California State University, Long Beach
- Colgate University
- Eastern Michigan University
- Georgia Southern University
- San Francisco State University
- Santa Clara University
- Sonoma State University
- University of British Columbia
- University of California at Northridge
- University of Chicago
- University of Louisville
- University of Nevada, Las Vegas
- University of Nevada, Reno
- University of Utah
- Utah State Archives
- Valparaiso University
The ARS is 50' in height. There is potential for an additional 2,000 sf of program to be added on the 3rd and 4th levels above the support program.