

PLANNING A HIGH-BAY FACILITY

SPACE CONSIDERATIONS FOR OFF-SITE SHELVING

Planning Considerations

Planning a high-bay shelving facility is a complex task. Taking the following considerations into account early in the planning stages will help ensure the most efficient construction and move-in processes.



Site Selection

The high cost of prime real estate often requires off-site facilities to be located in older buildings or in new facilities on the outskirts of a city or town. Regardless of whether a new or existing facility will be used, soil tests and structural tests are required to ensure the site can support the weight of the structure and its contents.



Storage Space Requirements

Estimating how many volumes will need to be stored at the present day and into the future is an important consideration when determining storage space requirements, but it's only part of the process. A growing number of project planners and librarians are choosing to store volumes in boxes by size, rather than by subject. Since all volumes and boxes are barcoded, volumes can be easily located in the high bay system, no matter where they're stored.

Storing materials by size rather than call number can increase space efficiency in a high-bay facility by an additional 15 percent. Facilities that store by size require an alternative organizational system to facilitate retrieval, so staff sort incoming materials by height and depth and place each item in one of several sizes of archival-quality paperboard trays. Barcodes indicate each item's location.



Environmental Control

To meet preservation standards, it's necessary to maintain proper humidity, temperature, and ventilation at all times. While experts disagree as to the ideal range of acceptable humidity levels, 30-50% humidity is generally considered acceptable, with lower levels being more desirable. Because HVAC systems take up a substantial amount of space, the placement of vents, fans, and other components that could potentially obstruct storage systems must be accounted for during the early planning phase.

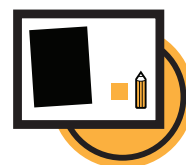
Large off-site storage facilities have significant long-term costs associated with controlling temperature and relative humidity. The smaller the area that needs to be heated or cooled, the lower the utility costs. After conducting a thorough cost analysis, the Zhang Legacy Collections Center at Western Michigan University opted for Spacesaver's XTend® Mobile High-Bay Storage System. The Spacesaver system reduced costs by allowing for a smaller building footprint, reduced energy consumption, and a more convenient location.



Shelving and Retrieval

High-bay systems require a picker or lift to enable staffers to safely shelf items and retrieve them from storage. When planning the layout of a facility, it's important to consider not only the dimensions of the picker itself and the space it will require to operate,

but also the picker's various accessories. For instance, pickers require battery charging stations, which in turn often require eye-washing stations within a certain distance from the charger. Factors like these must be accounted for when determining a facility's layout and calculating its potential capacity.



Processing Space

Any library facility, large or small, needs to set aside space for processing volumes. This is particularly important in high-bay facilities, where volumes usually need to be sorted by size and placed in boxes before being shelved. Space is needed to measure and categorize volumes, store empty and partially filled boxes, and store filled boxes awaiting reshelfing. The pickers used in high-bay systems can be fitted with carts that provide a workspace for staff to load and unload volumes, take notes, and complete other tasks while they're working in the shelving area.

Some high-bay shelving facilities set aside processing space to scan journal articles and other items that can be delivered electronically to patrons. This is faster and more convenient for patrons, and it cuts down on the number of materials that need to be transported back and forth from the shelving facility to campus.

Making the change from 'just-in-case' on-campus storage to 'just-in-time' delivery.



Code Compliance

The National Fire Protection Association (NFPA) codes have specific requirements regarding sprinklers, including sprinkler configurations, which can impact the height of high-bay shelving units. These requirements can also dictate the size of water mains that will serve the storage facility. Consulting with a fire protection engineer early in the planning process will help ensure that any potential compliance issues are addressed early on, rather than during a late-stage site inspection when remedies can be extremely expensive.

It's vitally important to involve code officials early in the planning process. One client waited to involve the local fire inspector in an off-site facility's design until late in design. At that point the inspector notified the institution that the water pump that fed the facility's sprinkler system was inadequate. That meant the water main had to be removed and replaced with a larger main, a process that resulted in considerable expense and schedule delay.



Testing and Certification

All systems in a high-bay storage facility should be thoroughly tested to ensure compliance with accepted standards, including fire safety standards, powder-coat paint specifications set forth by the American Library Association, and HVAC configuration. Floor levelness is also a major consideration, particularly when compact mobile rail systems will be installed for a mobile high-bay storage system.



Future Needs

Even with an increased emphasis on digital information, most institutions continue to acquire large numbers of paper-based books and other materials. The University of Wisconsin-Madison, for instance, continues

to acquire such materials at the rate of approximately one linear mile of shelving per year. High-bay shelving units can be added over time, as libraries acquire more materials.

As faculty and staff planned an off-site shelving facility at Wake Forest University, they knew they couldn't immediately install all the shelving they would need in the future. They installed the rails for the XTend® Mobile High-Bay Storage System when the facility was built and planned to add more shelving units to the facility over time.



Conditioning and Quarantine

Given that stored items benefit from constant temperatures and humidity levels, some facilities are designed with interior loading docks that function as conditioning areas. While these areas aren't necessarily air-tight, they function in much the same way as an airlock does: they allow materials to transition from one environment to another. Interior loading docks and processing areas allow books and other materials to be brought to temperature in a low-humidity environment to prevent harmful condensation. Some facilities have also implemented quarantine procedures to ensure that insects and other pests don't destroy or damage stored materials.

Emory and Georgia Tech joined forces to create a new shelving facility that was designed around intake and retrieval procedures, with the goal of integrating the facility with campus as closely as possible. The architects designed a processing area that featured easy access to shelving areas and an interior loading dock for trucks and other vehicles. Vehicles pull completely into the building before unloading, and books and other materials are brought to temperature and quarantined before being placed in the shelving area. Like many shelving facilities, the building complex also includes an anti-microbial air filtration system to prevent the growth of mold, fungus, and other potentially harmful organisms.

The Bidding Process

For libraries at many large research institutions, the bidding process for the design and construction of an off-site facility is out of their hands. A separate division of the university — or even an entirely different state agency — is required to oversee the bid process and accept the lowest bid for architectural and building services.

In these instances, it's vitally important to educate the bid process supervisors about the importance of selecting experienced architects and contractors who thoroughly understand the complexities of designing and building a high-bay facility.

If that isn't possible, library professionals should take steps soon after the winning bids are announced to educate the project architects about these considerations. The high-bay storage experts at Spacesaver welcome invitations to share our knowledge and insights with architects, contractors, library professionals, and other project stakeholders.

Making the Move

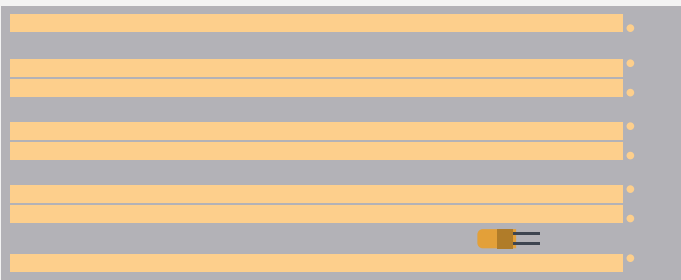
$$\frac{\left[\begin{array}{c} \text{Construction Cost} \\ + \\ \text{Lifecycle Operating Cost*} \end{array} \right]}{\left[\begin{array}{c} \text{Total Volumes Stored} \end{array} \right]} = \text{Lifecycle Cost per Volume}$$

**Heating/lighting/power over 20 years*

Determining the optimal type of high-bay shelving system involves more than simply considering the costs associated with site acquisition, construction, and ongoing operation.

We recommend calculating the **Lifecycle Cost per Volume**, which measures the costs of storing a single volume over a period of time (20 years, for example), while factoring in the costs of real estate, construction, and on-going operations. Determining the Lifecycle Cost per Volume values for different scenarios offers a simple and accurate way to choose the most cost-effective option.

1 Static High-Bay Shelving System



A high-bay shelving system makes maximum use of vertical space. Shelving can be easily adjusted based on book size or box type to condense collections.

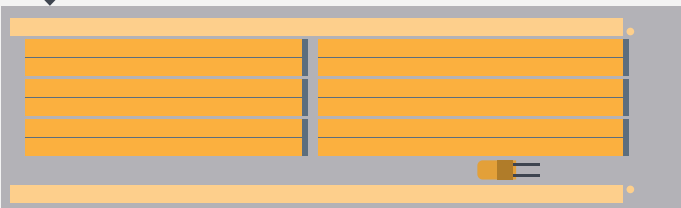
Lifecycle Cost:

 **\$2.99**
volume

$\left[\begin{array}{c} \$2,050,000 \\ \text{Construction w/shelving} \end{array} \right] + \left[\begin{array}{c} \$940,532 \\ \text{Lifecycle operating cost} \end{array} \right]$
1,000,000 Volumes

2 Mobile High-Bay Systems Require Less Floor Space

 Smaller facility



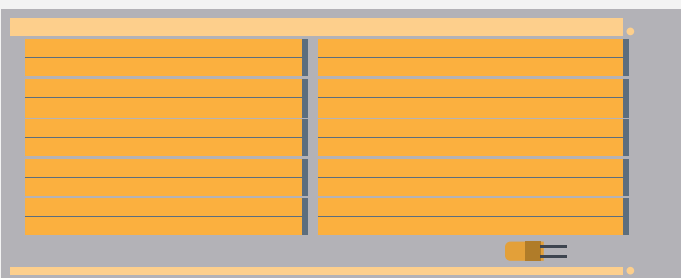
A smaller facility can be built when a high-bay system is compacted to eliminate empty aisle space, which results in decreased operational costs.

Lifecycle Cost:

 **\$2.48**
volume

$\left[\begin{array}{c} \$1,740,000 \\ \text{Construction of smaller bldg w/shelving} \end{array} \right] + \left[\begin{array}{c} \$736,168 \\ \text{Lifecycle operating cost} \end{array} \right]$
1,000,000 Volumes

3 Mobile High-Bay Systems at Full Capacity



When the same facility is filled with items stored on a mobile system, more volumes can be stored. The items remain accessible and organized while significant capacity is gained.

Lifecycle Cost:

 **\$2.66**
volume

$\left[\begin{array}{c} \$2,480,000 \\ \text{Construction of smaller bldg w/shelving} \end{array} \right] + \left[\begin{array}{c} \$1,033,557 \\ \text{Lifecycle operating cost} \end{array} \right]$
1,320,000 Volumes

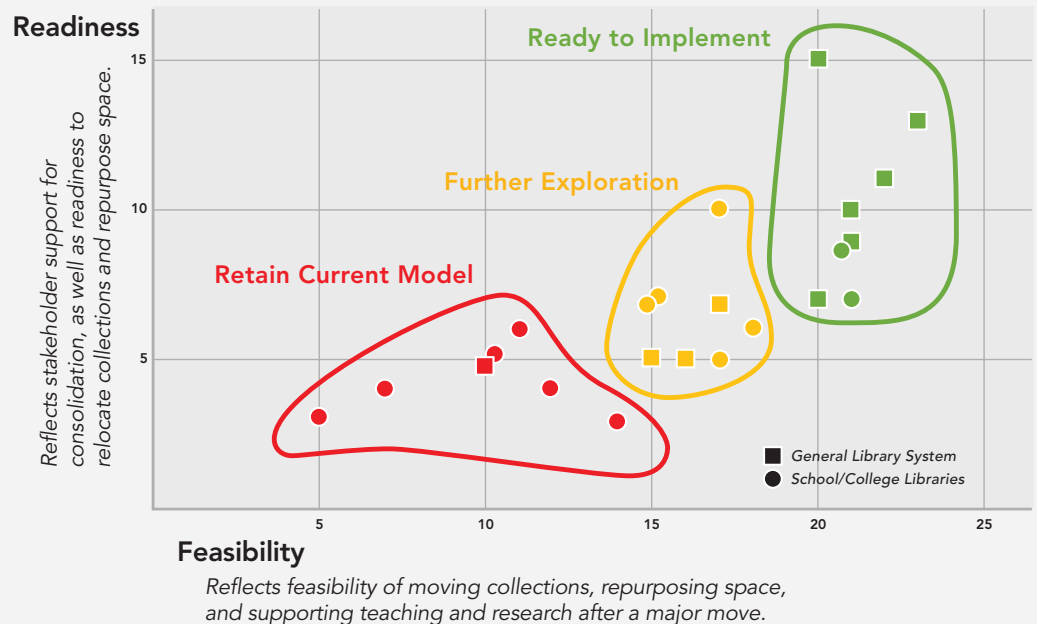
When dealing with millions of volumes, it's easy to see how the savings add up.

What Moves When?

The UW-Madison devised a novel way to determine which on-campus libraries were most ready to consolidate printed materials and repurpose space.

Even at a time when the UW-Madison is emphasizing digital strategies, the institution's libraries continue to acquire more than a linear mile's worth of print-based books and journals every year. The construction of a new high-density shelving facility in Verona, Wisconsin, about 10 miles south of campus, is enabling the university to honor its obligation to store print-based materials while still gaining space for renovations.

UW-Madison's method for determining which libraries to designate for consolidation*



*Source: UW-Madison Libraries Consolidation Report, 10 December 2015, page 9

Gathering Data

Consolidating the contents of a complex, campus-wide library network into offsite shelving requires a deliberate plan of action. To that end, the UW-Madison established committees to recommend strategies that would strengthen core library functions, redesign campus spaces to create new learning environments, locate related collections closer together, and streamline processes. The Consolidation Working Group interviewed library staff regarding services offered, staffing levels, and budgets in the various libraries around campus. The group also gathered data regarding circulation statistics, gate counts, shelf space, and the square footage of various libraries.

Assigning Scores

Using these data, the group assigned two scores to most campus libraries. The Feasibility Assessment Score reflected the feasibility of moving a library's collection and repurposing space, as well as potential cost savings and the feasibility of supporting teaching and research if a major relocation were to take place. The Readiness Assessment Score reflects the preparedness and feasibility of a stakeholder to participate in consolidation, relocate collections, and/or repurpose space, as well as the consolidation's overarching strategy.

Making Recommendations

After the assessment scores were assigned, the group plotted the results on a graph and three distinct groups emerged: locations that were ready to implement a new service model, locations that required further exploration, and locations that should retain their current model. Libraries identified as ready to implement a new service model were the first libraries designated to move into the next phase of consolidation, and those libraries are currently working with their respective stakeholders to develop consolidation plans.

Spacesaver is the industry leader in high-bay shelving and we hold the patent on XTend® Mobile High-Bay Storage Systems. We know that providing safe, accessible, and well-organized collections storage is at the core of your mission, and we're here to help.

We invite you to involve our knowledgeable consultants early in the design process to benefit from their space consulting services, design assistance, and extensive experience. Not only regarding storage, but our experts are versed in fire suppression, HVAC, flooring, lift requirements, and locator software.

Our products are also available for purchase on a number of state and national contracts, including GSA, NJPA, and National IPA.

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"At first the architect thought this facility was 'just a box,' and we did, too. But when you start learning more you realize you have to deal with the HVAC, and the wire guides, and the floor has to be able to hold an incredible amount of weight. It's not just a box. It's this elaborate system that all has to work together."

Heather Weltin
University of Wisconsin-Madison Libraries



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