The Evolving LIBRARY

Bright daylight and colored glass panels activate the reading area at a K-8 school library in New Haven, Conn.'s Columbus Family Academy.

By C.C. Sullivan and Barbara Horwitz-Bennett

Now at a major crossroads, the traditional library—essentially a book-oriented community center—is evolving into a digital wonderland of Internet, e-books, videos, and social media. Consequently, with print reference collections shrinking by at least 50% and digital-minded teens and young adults coming up through the ranks, library designers are being challenged to come up with a new model.

Libraries are more complex design challenges than ever before, concludes Elliott Felix, associate director of the consulting firm DEGW (www.degw.com), New York, N.Y. "Now libraries must enable people to access hundreds of different types of media and technologies, help people navigate the information landscape, and provide a variety of physical and virtual spaces for them to work in—not only to retrieve information but to create it, share it, combine it, and refine it."

"At this time, libraries are experiencing a wonderful transition from tra-

Learning Objectives

After reading this article, you should be able to:
- ✔ Discuss key trends affecting the design and use of libraries.
- ✔ Explain how technology and user preferences are shaping library interiors.
- ✔ List the elements of IEQ for libraries.
- ✔ Describe the interior furnishings, materials, and MEP systems that contribute to healthy, sustainable library interiors.

The Fanning Howey-designed youth section at Bloomfield Township Public Library in Bloomfield Hills, Mich., features colorful décor, comfortable lounge seating, open space, natural light, and a central service desk—all key components of contemporary library design.

ditional storage facilities for books, to expressive community spaces with enhanced media and digital capabilities," relates Richard D'Amato, AIA, LEED AP, senior design principal, LPA Inc. (www.lpainc.com), Irvine, Calif. "We are experiencing a renaissance of library design, with interactive kiosks, group-based children and teen centers, flexible community

Goucher's media center, referred to as the Information Commons, is prominently located next to the main entrance behind acoustically sound glass walls, providing sound buffering, transparency, and natural light.

rooms, and technology centers."

At the same time, baby boomers still make up a large percentage of a public library's service population. "While the presence of digital media continues to increase, I believe the book will continue its importance as a medium for learning and enjoyment," says Thomas Sens, AIA, LEED AP, client leader, BHDP Architecture (www.bhdp.com), Cincinnati. "The book's physical presence reinforces the library as an institution of learning and will continue to be with us for some time to come."

DEGW's Felix agrees: "Though it is tempting to see digital media as a replacement for their physical counterparts, at least in the near term, the role is more complementary." A greater challenge, he says, is rethinking and reorganizing libraries so they keep pace with and anticipate change as their value shifts. "Information is no longer the main reason to visit a library," he says. "Anywhere, anytime access to information is a given. So, the value of a library is now in the kinds of experiences it creates for its users by integrating space, support services, and technology. This plays out whether you're renovating an existing space or creating a new library from the ground up."

While today's libraries are busily redefining their mix of services, they also find they are competing with the trendy, consumer-oriented environments offered by the likes of Borders and Barnes & Noble. For this reason, user comfort and trendy design have become much more of a priority.

"People will come and stay much longer if it is a comfortable and pleasing environment," notes Denelle C. Wrightson AIA, NCARB, LEED AP, director of library architecture, PSA-Dewberry (www.psa-dewberry.com), Dallas. "We use natural daylighting, color and materials, and a large variety of seating to create this type of a space."

For academic libraries, the client's charge is to go beyond merely enjoyable surroundings to those that move students to learn, says Jay Brotman, AIA, a partner with Svigals + Partners, New Haven, Conn.

"Our goal is to provide a homelike atmosphere where small groups or individuals can get comfortable and focus on their learning. But libraries—often called 'media centers' at primary and secondary schools—are just as much places to get books or use computers as they are places to inspire the imagination and creative energy of students," says Brotman. "For our K-8 projects, we employ a range of techniques to foster this inspiration, including collaborative art projects." As an example, Brotman points to the colored glass panels and 11-foot-long decorative hanging banners at Columbus Family Academy in New Haven, Conn., which promote the school's theme of creative discovery.

At university and community libraries, comfort is again

A model of sustainable design, the new LPA-designed Redding (Calif.) Library features a 7,000-sf vegetated roof, an ice-harvesting system, photovoltaic power, thermal energy storage, and extensive use of recycled materials. Signage throughout the facility provides an educational platform on building sustainability for library patrons.

just as important as technology. Perhaps the biggest change in the realm of furnishings has been replacing traditional hard-backed, wooden chairs with lounge-type seating. For example, at Ohio's Miami University, BHDP recommended large beanbag chairs to be located throughout the library. The result? Students are spending longer hours at the library reading, studying, relaxing, and even napping on the beanbags, reports Sens.

FLEXIBILITY IN PLANNING AND DESIGN

Beyond seating, with user groups changing and library technology in constant flux, building designs must be as flexible as possible. Building Teams must test various configurations to achieve the optimal balance between print and digital services, says Maddy Burke-Vigeland, AIA, LEED AP, a principal in the New York office of Gensler (www.gensler.com).

For example, Laura J. Isenstein, principal of the library consulting firm Providence Associates (www.librarybuildingconsultants.com), Cottonwood, Ariz., says library owners may want "living room-type spaces to relax and read, quiet areas where one can reflect and concentrate without distractions, and cafés where one can engage in conversation over beverages." Other possibilities: for collaborative and group study equipped with all the technologies that support learning and development of presentations; large and small community engagement spaces; and multipurpose event spaces with catering kitchens and meeting rooms.

James R. Mumby, AIA, LEED AP, library planning group director with Fanning Howey (www.fanninghowey.com), Toledo, stresses the importance of advocating for the comfort of the library staff as well, particularly in the choice of furniture for the staff, whether it's ergonomically designed workstation chairs or height-adjustable computer stations and circulation desks.

Of course, to create popular and appealing library facilities, librarians and Building Teams must be able to work together when planning these unique service-oriented spaces; it is wise to go the extra mile to involve the librarians throughout the process. "Librarians typically have a real thirst for knowledge and are very interested in the details of the project," says PSA-Dewberry's Wrightson, who has more than 160 library facility projects to her credit. "We have found that spending a little time educating the librarians on square footage during programming, how to read the architectural and engineering drawings during the design and production, and involving them in the construction meetings helps provide better communication and thus a more successful project."

Fanning Howey uses a hands-on approach it calls the "furniture mart." During a collaborative session, furniture manufacturers will bring in samples so that end users can come and kick the tires—or, more aptly, the chair legs—before making purchase decisions, according to Mumby.

Pendants, roof monitors, daylighting, and direct/indirect lighting combine to illuminate the multimedia section of the Hanover (Ill.) Park Branch Library, designed by PSA-Dewberry.

Another important point not to be overlooked during the process is planning for the future, especially since a typical library project takes three to four years. "Many Building Teams have never experienced what we see as the library of tomorrow, and they have a hard time envisioning it as the active learning laboratory/information commons that it will be if it is to fulfill its ultimate role," says Carolyn Markuson, PhD, president of the facility consulting firm biblioTECH (www.bibliotechconsultants.com), Cambridge, Mass.

Library consultants also have a valuable role to play in this process, bringing in their knowledge of trends and best practices and serving as a liaison between the library and Building Team.

For the University of Virginia's Alderman Library, a project team led by DEGW focused on optimizing the physical storage and retrieval of books. The solution, currently in the design phase, creates a new balance and organization of spaces: less space for physical collections and more space for library users, with an emphasis on providing space for collaborative work. "These and other shifts were keys to repositioning the library as an 'intellectual crossroads,' a place for the everyone to connect, collaborate, and concentrate," says DEGW's Felix.

MEETING LIBRARY DESIGN STANDARDS

Addressing the more technical details of the program planning process, computing the square footage needed for shelving while providing for the smooth flow of patrons through the facility can be a tricky calculation. To get started, Building Teams should be familiar with industry standards such as the American Library Association's "Building Blocks for Library Planning" (www.ala.org), which can be a valuable guide to planning metrics. Another popular space programming tool is Libris Design (www.libris-design.org) for collection allocation, shelving calculations, and programming gross area requirements.

Anticipating real-world variables, though, adds to the fun. For example, calculating the percentage of materials that will be checked out at any one time directly affects the amount of shelving space needed. Furthermore, the more user-friendly a collection is, the more positively it affects circulation rates and lowers shelf space requirements. For example, Wrightson has found that a correctly displayed, high-quality audio-visual collection may have up to 70% of its items checked out at one time.

This being the case, designers often find themselves playing around with aisle width, shelving widths, and shelving heights to optimize the browsing experience. Of course, increasing these metrics can be pricey in terms of real estate.

Standard metrics for shelving heights vary from 66 inches to 90 inches. The minmum aisle width required by the Americans with Disabilities Act (ADA) is 36 inches; the preferred width is 48 inches, but this can increase the required floor area by 15%-20%, according to Fanning Howey's Mumby. While the shelving range should not exceed eight units, a range of six or seven units can make a collection more accessible to the user. "Again, by choosing a shorter [shelf unit] range, there is a corresponding tradeoff in additional floor area—as much as a 5%-10% increase in required collection space," says Mumby, who has worked on more than 35 library projects throughout his career.

Of course, the continuing shift from print to digital must be factored in as well. At the same time, however, it is important to note that required space for user seating is also on the rise. "Realistically, a contemporary library should allow between 30 to 50 square feet per user seat to accommodate user preferences and use of technology. This is a significant increase over the design standard of 25 to 30 square feet per seat used in the planning of many older libraries and in some state-legislated library planning metrics," notes Janette Blackburn, AIA, LEED AP, a principal Boston's Shepley Bulfinch Richardson & Abbott (www.shepleybulfinch.com).

At the same, space requirements can be kept under control by installing compact movable shelving for less-frequented collections. These systems use half the space but still keep the material easy to browse, according to Joseph C. Rizzo, AIA, ALA, a principal and library specialist in the New York office of RMJM (www.rmjm.com).

For example, in planning the new Hunt Library at North Carolina State University, Greensboro, with architects Snøhetta and PBC+L, DEGW was able to reduce the size of the overall building by employing a high-density automated retrieval system for the collection. For sustainability purposes, the team carefully distributed library functions so that parts of the building can be closed at night or in summer months while the rest of the library remains fully functional.

To take advantage of such strategies, however, the Building Team must understand what "a day in the life" might look

like for various types of library users, says Felix. Doing so at the Hunt Library "enabled the library to account for new challenges, such as users' mobile devices, and to create undefined spaces that function more like blank canvases whose character is determined by how they are used—quiet study at

some times, energetic collaboration at others."

As for accommodating interior uses, it's important to study internal and external book flow, patron flow, and library staff work-process flow to best understand relationships and adjacencies, according to the American Library Association. Then, armed with a strong understanding of work patterns and patron usage, a more efficient and cost-effective design solution can be produced, adds BHDP's Sens.

Architectural elements such as color, materials, light, pathways, and simple maps can better promote wayfinding. "Hierarchy, visual connectivity, layered transactional models for staffing, creating landmarks, minimizing turns, and signage all empower users to take full advantage of libraries that are increasingly open, each with more choice as to where to study, where to go for help, and collection sources and media types," says DEGW's Felix.

NARA Temperature and Relative Humidity Standards for Archival Records

Records medium	Maximum dry bulb temperature	Relative humidity
Paper	65°F	35-45%, +/-5%

Source: National Archives and Records Administration

The National Archives and Records Administration—"the nation's record keeper"—has ultrastrict temperature and relative humidity standards.

Cost Controls at a Public Library in Texas

Despite the economic downturn, many new library projects are popping up around the country, but one in particular stands out as a good example of employing cost-control measures and running an effective bidding/evaluation process.

In Keller, Texas, PSA-Dewberry is knee-deep in a 12,000-sf renovation and 10,000-sf addition for Keller Public Library, scheduled to open this month, with a new two-story glass entry covered by a cantilevered canopy, and a southern façade, also clad in glass, to provide an enticing outdoor view to a neighboring park.

With cost-effective design in mind, PSA-Dewberry designers looked at the most efficient configurations from the start. "We looked at minimizing our corridor lengths and the amount of glazing used without compromising the use of natural daylight into the spaces," notes Denelle C. Wrightson AIA, NCARB, LEED AP, PSA-Dewberry's director of library architecture, based in Dallas. "We also took a critical look at the height of the building elements to see if we could reduce the height and save money on the exterior materials of the building."

As the design team continued to detail the building, a number of dif-

RENDERING: PSA-DEWBERRY

This artist's rendering of the newly opened Keller Public Library represents a well-designed and executed project process on the part of PSA-Dewberry, with cost control and quality in mind.

ferent systems were evaluated based upon optimal sizing, efficient use of materials, and minimizing waste.

When it came time for bidding, PSA-Dewberry generally aims for between eight and 12 general contractor bids to ensure the best pricing, but in this case, 23 contractors threw their hats in the ring.

"To evaluate the bids, we reviewed the top General Contractors Qualifications Statements, which verified their background, references, and financial stability," recalls Wrightson. "We also asked what personnel the general contractor would be using as project manager and project superintendant, paying very close attention to the superintendant, who would be

directing the daily work on the project."

Ultimately, the global construction firm VCC, Irvine, Calif., was awarded the project.

On the mechanical/electrical side of the final design, a centrally controlled lighting system, with localized occupancy-based sensing controls in selected areas, will turn off all pre-programmed lights in a nighttime sweep. For IAQ, CO_2 sensors, based upon occupancy, will control outdoor air intake, and the AC units have been equipped with room humidity sensors. However, for the IT server room, a separate environmental system has been dedicated to maintain desired temperature and humidity ranges.

NARA Air Pollution Limits for Archival Records

Type of pollutant	Maximum permitted (in parts per billion)
Sulfur dioxide	1.0
Nitrogen dioxide	2.6
Ozone	2.0
Formaldehyde	4.0
Acetic acid	4.0

Source: National Archives and Records Administration

Maximum pollutant levels at the National Archives, which preserves about 1-3% of all documents created by the U.S. government.

UPPING THE Q IN IEQ

Building products, materials, and systems are critical to project success and should be selected carefully for today's media centers and libraries. "In addition to the standard metrics recommended by the American Library Association, Building Teams can put together a list of standard finishes, materials, and furnishings that are simply proven to work well at a good life cycle cost," says Svigals + Partners' Brotman. "Examples include low-VOC paints, low-e windows with treatments to protect against glare, and acoustically forgiving carpeted floors and ceiling tiles. Where possible, acoustical panels are recommended on such hard surfaces as walls and column covers."

Well-coordinated engineered systems are essential to successful library operations, say library specialists. One of the more critical of these is an HVAC system that promotes good indoor air quality, a major component of indoor environmental quality. Given the increasing diversity of spaces within libraries, from large, open meeting areas to stacks of rare, historic collections, this is no simple task. Consequently, a variety of HVAC systems will often be included in the overall design.

Fortunately, current sustainable design principles already provide a leg up in the process, whether it's the percentage of outdoor air required by mechanical codes, or the use of recommended low-VOC paints, sealants, and adhesives, says PSA-Dewberry's Wrightson.

▶ **Editor's Note** ◀

Additional required reading online! To earn 1 AIA/CES continuing education unit, complete the required reading and take the CEU test posted at www.bdcnetwork.com/article/442807-January_2010_AIA_CE_exam_High_Performance_Workplaces.php.

LIBRARIES AND IEQ EDUCATION MODULE

Pass this exam and earn 1 AIA/CES credit! You must go to www.bdcnetwork.com/article/451790-Public_Buildings_The_Evolving_Library.php to take this exam!

1. The traditional book-oriented library is evolving into media centers with Internet access, e-books, videos, and social media. Consequently, experts estimate, the average print reference collection is shrinking by about:
   A. Less than 1%.
   B. 5%.
   C. 25%.
   D. 50%.

2. In general, library design has been affected by end-user expectations and consumer-oriented bookstore environments, putting a renewed priority on:
   A. Point-of-sale information kiosks and cafés.
   B. User comfort, homelike atmosphere, and trendy interior design.
   C. More durable interior finishes and less seating and furniture.
   D. None of the above.

3. True or false: Library designs must plan for the future, because a typical library project takes three to four years to complete.
   A. True.
   B. False.

4. The minimum ADA-required aisle width for libraries is 36 inches, although experienced Building Teams recommend 48 inches, which can increase required floor area by:
   A. Less than 2%.
   B. About 5%.
   C. About 15-20%.
   D. No significant increase.

5. Today's library layouts generally allow 30-50 square feet per user seat to accommodate user preferences and use of technology. This is a significant increase over the design standard of older libraries and the requirements of some state-legislated library planning metrics, which was:
   A. 25-30 square feet per seat.
   B. 15 to 18.5 square feet per seat.
   C. Less than 10 square feet per seat
   D. None of the above.

6. True or false: To control and manage dust in libraries, return-air systems should be located overhead, and air filters with a minimal rating of MERV 3 should be employed.
   A. True.
   B. False.

7. According to the American Library Association, to best accommodate interior library uses, it's important to study which library processes?
   A. Internal and external book flow.
   B. Patron flow.
   C. Library staff work-process flow.

   D. All of the above.

8. For library areas with historic books and other sensitive materials, UV light must be screened out and a constant-temperature, constant-humidity (CTCH) environment should be maintained, typically at:
   A. 60ºF temperature and 40% relative humidity level.
   B. 70ºF and 60% relative humidity.
   C. 72ºF and 40% relative humidity.
   D. None of the above.

9. To accommodate library patrons with special needs for accessibility or library use, Building Teams should consider including the following in the final design:
   A. Adjustable-height tables.
   B. Adequate aisle widths for wheelchair mobility.
   C. Adaptive PC technology.
   D. All of the above.

10. According to library specialists, interior fixtures and shelving are moving toward products and systems that reflect those in which building type?
   A. Warehouses.
   B. Hospitals.
   C. Retails stores.
   D. All of the above.

The library at the John S. Martinez School, Fair Haven, Conn., by Svigals + Partners, features ample daylighting and neutral colors for long-term shelving of books.

In addition, strategies such as displaced air systems and smaller temperature control zones are often employed.

Yet another significant consideration is the control and management of dust, notes Fanning Howey's Mumby: "Collections can contribute a surprising amount of dirt and dust to the atmosphere. If possible, return air systems should be placed at the floor level so that dust and dirt are drawn down to the floor." BHDP's Sens recommends employing high-quality air filters with a minimal rating of MERV 8 to protect occupants and library materials from dust particles.

(MERV, or Minimum Efficiency Reporting Value, is determined by ASHRAE's standard 52.2. It ranges from MERV 1 for some residential filters to MERV 16 for those used in critical healthcare facilities.)

When it comes to rare books and special collections, the IAQ stakes and requirements are much higher. Consequently, it is often best to specify a separate HVAC system for these spaces, recommends D'Amato, an active member of the ALA,

Illustrating a well-integrated lighting/daylighting system, a combination of natural light, direct task lighting, and indirect light illuminates Temecula's bookstack area and reading row lining the perimeter.

the Public Library Association, and the California Library Association. "These spaces demand an essentially constant environment where temperature and humidity are kept within a very close range, regardless of the time of day or occupancy," stresses Rizzo. "UV light must be screened out and very efficient filter systems are required to provide the air quality necessary to protect these sensitive and irreplaceable collections."

As a rule of thumb, Sens recommends a "CTCH" environment—constant temperature, constant humidity—to maintain a 60°F temperature and 40% relative humidity, with automatic alarms to alert staff if levels vary from these set points. Considering these stringent and requirements, and the capital expense involved in preserving these collections, it behooves the library to carefully sift through which materials truly belong in the historic book archives, advises Mumby.

DAYLIGHTING AND ACOUSTICS
Beyond air quality, today's sustainable design strategies, such as those in the U.S. Green Building Council's LEED rating system and the Green Building Initiative's Green Globes system, can produce good IEQ environment with ample sunlight, outdoor views, and good acoustics.

In terms of daylight, "Research and common sense attests to the fact that people like to have ambient light and to see outdoors," says biblioTECH's Markuson, who has worked on more than 60 library projects in the past 30 years. "For example, windowless boxes for computer areas were never successful and are rarely seen today." RMJM's Mumby has observed how an external view into the heart of the building can entice passersby to visit the library.

In order to maximize transparency for occupants, Sens recommends placing closed offices, conference rooms, and book stacks toward the interior in order to reserve the perimeter for study carrels and public spaces. DEGW's Felix also predicts more user control over the environment in future library designs, with movable walls in some spaces and customizable technological tools. "For the stuff we can't predict, flexibility will best be achieved by providing a diverse mix of different kinds of spaces—big and small, open and enclosed, indoor and outdoor, individual and collaborative, soft and hard—and letting people find their own place," he says.

At the same time, windows must be planned strategically so as to avoid solar heat gain, glare, and UV rays in the building interior. Generally speaking, the placement, size, and type of window depends on the building's solar orientation. "If the library faces north or south, it could be the best of all worlds," says biblioTECH's Markuson. "If it faces east or west, window shades, grids, or blinds need to be considered."

Sound planning and design are also in order when it comes to acoustics. For starters, considering that the children's book stacks and circulation desks can be quite noisy, it's important

that these sections be strategically located within the library. "We recommend placing the youth area as close to the front door as possible so this age group does not need to work its way through the library," advises Mumby.

Multi-story open spaces such as atriums and monumental stairs require separation, explains Joseph A. Rondinelli, a senior associate with Shepley Bulfinch, Boston. "Sound-absorptive ceiling and flooring materials are essential for acoustical control," he adds. He recommends using spray-on acoustical materials, surface-applied or suspended acoustical ceiling panels, and carpet or carpet tile flooring.

Mechanical systems must also be properly designed and positioned, with appropriately sized ductwork and isolated mechanical rooms and equipment locations. "Vibration control on equipment and sound attenuation in the ductwork can also help minimize ambient noise," adds Mumby.

MEDIA CENTERS AND INFORMATION TECHNOLOGY

Flexibility, adaptability, and more flexibility are the big buzzwords when it comes to designing library media centers, especially now that a typical life cycle for telecommunications equipment is just a year and a half, says Providence Associates' Isenstein. "The most important thing is the ability to pull wires or fiber anywhere, at any time, and to connect a device almost anyplace, or anywhere, in the library," she says.

To enable this, raised floor systems, with their ample access for electrical and data cabling, are becoming more popular. Sens also points out, however, that raised-floor systems do come with an initial cost premium, not to mention the required floor-to-floor heights to make them feasible.

As for ceilings, flexibility can be built in by use of a hanging system to support items such as projectors, cameras, and flat panels. "A simple unistrut-type system can make future changes quite easy," says Shepley Bulfinch's Blackburn, who has served as the lead architect and planner for more than 30 higher education and library projects.

In addition, furniture and workspaces must offer flexibility to enable ease of reconfiguration and the ability to accommodate patrons bringing in their own laptops and other electrical devices (PDAs, iPods, cell phones, etc.) which may require recharging. "Mobile devices will continue to reshape libraries as people capitalize on location-aware technology. Imagine the technology around you displaying your work just by knowing you're in front of it," says DEGW's Felix. "Less infrastructure will be required since the kinds of technologies that are now large, fixed, and wired to buildings, like projectors and desktop computers, will become small, mobile, and personal."

Of course, the exponential growth in user-supplied technology may also require wireless access and easily accessible electrical outlets. Experts such as biblioTECH's Rolf Erikson remind Building Teams to specify robust electrical systems.

Security Design in Public Libraries

As an important public gathering place with lots of valuable contents, security design for public libraries is a high-priority item.

James R. Mumby, AIA, LEED AP, director of the library planning group at architect Fanning Howey, Toledo, advises taking a cautious approach. "When it comes to creating a secure environment, we counsel our clients to first explore passive security measures before investing in expensive security systems," he says. "Secure entry vestibules, ample exterior lighting, eliminating hidden corners, and other best practices can increase security at minimal cost."

Emphasizing visibility, Richard D'Amato, AIA, LEED AP, senior design principal at LPA Inc., Irvine, Calif., sees contiguous space with optimized direct visibility from the staff areas as a key passive security measure.

Similarly, clear wayfinding systems and interior glazing to increase visibility contribute toward this end. Then, once these essentials are in place, technological solutions such as security cameras, card-access systems, alarms, and book theft detection systems are typically employed, according to Joseph A. Rondinelli, a senior associate with Shepley Bulfinch, Boston. He says that the factors which help determine the necessary level of security include the value of the print collection, technology equipment, and art; the library's location and hours of operation; and user group demographics.

While multiple entrances may be of appeal to contemporary library architecture, limiting the design to one main entrance will cut down on the security hardware, staff, and associated expenses required to monitor that public entry/exit point.

As for stopping book theft, the two major technologies now being employed include electromagnetic detection and radio frequency identification. RFID has the advantage of integrating book identification and security onto one label, as well as the ability to read more than one book at a time, thereby speeding up circulation.

These can include electrical outlets in columns enclosures and walls (even those that may initially be covered by shelving); electrical connection boxes above the ceiling tiles; and surge protection and uninterrupted power supplies.

As for floor outlets, "Electrical outlets that are flush with the floor are often included in the design. Since hard-surface floors are washed and waxed and carpets are shampooed, this is not always the best solution, although for certain power requirements, it may be the only solution," says Erikson, co-author (with Markuson) of the American Library Association book

PHOTO: LPA, INC.

View of the 7,000-sf vegetated roof at Redding (Calif.) Public Library, designed by architecture firm LPA, Inc. Public libraries are becoming a breeding ground of sustainable design and green building practices.

Designing a School Library Media Center for the Future.

As for computer workstations, Erikson points out that these spaces are often only wide enough to hold the computer equipment and don't take into account the personal items which patrons may bring along. "This results in a cramped and uncomfortable work space, and it precludes any type of cooperative learning or collaborative work," he says.

In addition to considerations of flexibility that must be designed into the infrastructure and furniture, accessibility and special needs are at least equally important. Adjustable-height tables, adequate aisle widths for wheelchair mobility, and adaptive PC technology are key elements in making a library user-friendly for disabled patrons. In particular, computer workstations should be wheelchair accessible, and designated computers should be equipped with features such as screen reading programs, enlargement, and synthetic speech. Of course, without trained staff to help patrons in need of such enhanced computer services, such added features could go largely unused.

STORAGE, SHELVING, AND FIXTURING

Shelving and storage have a unique role to play in library design. Sharon Rowlen, CFM, a principal with Group3 Planners (www.group3planners.com), a library consulting firm in Arvada, Colo., observes that library shelving is moving toward a retail model, with an emphasis on merchandising.

"Bookstore-style shelving, including zigzag shelving, slat wall, wall-mounted grid racks, or other systems similar to those most often seen in retail space, is more prevalent and fosters customer browsing," adds Kimberly Bolan Cullin, of Providence Associates. "Interchangeable end-panels that allow for the incorporation of eye-catching graphics, merchandising of materials, and user-friendly signage are all key ele-

ments. This is drastically changing the way libraries and their customers view the overall library space and collections."

In addition, shelf height is being reduced to better simulate the consumer experience, says Joshua Katz, AIA, a principal with Gensler (www.gensler.com). "With lower shelves, people feel more comfortable and are more inclined to explore, rather than just grab what they came for," he says. Wrightson says retail is also the trend for audio-visual collections, with face-out browsing and flip-type secured cases, similar to a jukebox, which enables on-the-spot checkout.

Erikson offers the following shelving specification tips:
• Shelves should be easily height-adjustable without tools or excessive physical effort.
• Integral backs, 1-2 inches high, should be incorporated to prevent books from falling off the back of shelves or sliding through (and getting lost).
• Some sloped display shelving can be considered, to facilitate reading of titles and spine labels of books.
• Cantilever shelving is the most common and economical solution; it can be gussied up by adding wood or laminate end-panels and canopy tops.
• Compact movable shelving for storage of seldom-used special collections must have adequate safety features and be easy to operate. Generally the floor loading for such collections is higher than the norm, so floors must support weights up to 350 pounds per square foot.

Adding to that list, Rowlen emphasizes the importance of evaluating frame strength, shelf rigidity, and system flexibility. "Shelving and storage systems are all about flexibility for today's media centers," she says. Svigals + Partners' Jay Brotman agrees, adding, "This isn't just to accommodate changing IT infrastructure, but to help the client organization adapt to changing uses and needs," he says. "Our school clients, for example, use libraries for much more than just standard student uses. They also host community and staff meetings, readings, and standardized test groups."

As for color, trendy is fine for short-term display systems, but neutral colors should be chosen for long-term shelving, advises Brotman.

FURNITURE AND PARTITIONS

For both built-in library systems and furnishings, careful attention to finish and color is crucial. "It might be trendy to use a minimalist or light-colored palette in the media center, but it's not ideal for this heavy-use environment," says Brotman. "We recommend mid-range colors in eye-pleasing patterns and shades. Avoid very light and very dark colors, which don't mask wear and soiling well." As for fabrics, he says some heavy textures will create places for dirt and bacteria to lodge. The most lasting upholstery choices are nylon blends, polyolefin, and—when the budget permits—wool.

In other furniture trends, ergonomics, comfort, easy recon-figuration, and modularity are in, while heavy wooden tables and chairs, which have traditionally lined reading rooms, are on their way out. Lightweight chairs with mesh backs on casters are easily movable and stackable. Similarly, service and circulation desks are now modular and more mobile, as opposed to traditional fixed millwork furniture, according to BHDP's Sens. In addition, demountable wall partitions offer greater flexibility, although they come at a higher first cost.

As for lounge seating, the trend is toward residential. "Soft seating resembles one's living room more than an office, with the tables and lamps to complete the home-like atmosphere," explains Rowlen, drawing from more than 30 years of library de-sign experience. She cautions, however, that while some libraries are venturing outside the bounds of traditional library furniture manufacturers, "They need to stay with commercial furniture lines in order to meet maintenance, durability, and fire-code requirements, rather than tap into home furnishings offerings."

One other popular seating product has been the mobile laptop lounge chair, which enables users to set down a book or cup of coffee next to their laptops, with electrical access either built in or nearby. In order to support more collabora-tive learning, biblioTECH's Erikson and DEGW's Felix often recommend a range of novel seating arrangements, such as small bistro-type tables with bar-height stools, as well as restaurant-type booth seating.

Erikson offers the following design pointers for library furniture options available today:

• **Tabletops.** Laminate and linoleum tabletops are good choices because they are quite durable, reasonably easy to clean, and offer nice color. Linoleum, a natural and biode-gradable product, keeps its color all the way through (unlike laminate), and surface cuts and scratches actually grow back.

• **Circulation desks.** As the library's main service point, cir-culation desks should be planned carefully and offer a distinc-tive look. Ideally, they should be made from modular compo-nents, with varying work surface heights to fit different tasks.

• **Reading/study chairs.** Aesthetically, this type of seating should complement the overall architectural motif and the study tables in both style and color. Chairs with arms may be

comfy, but remember that younger patrons find it tempting to sit on the arms. Upholstered seats and backs are a nice option as long as the upholstery is of good quality and can be replaced easily.

• **Lounge chairs.** There should be a space between the back and seat to prevent dirt and objects from collecting in the crevice; the fabric should be easy to maintain and replace. Ottomans are also a nice addition to the lounge seating area.

• **Other seating.** Benches and built-in window seats can work well, particularly in the fiction area.

With upholstery becoming a more popular feature, it's im-portant to choose wisely. Interior designer Carole Graham, in the U.S. Institute of Museum and Library Services' Furniture for Libraries guide, explains that nylon and nylon blends are commonly available and offer strong durability. While wool is traditionally a top-quality upholstery fabric, and continues to be, it is more expensive. One other up-and-coming option is polyolefin, which is easy to clean.

As for color and texture, the California-based designer rec-ommends avoiding very light or dark solid colors as they do little to mask soil or damage. Also stay away from very heavy textures, which tend to attract dirt and bacteria.

Study carrels are another furniture type covered in Graham's furniture guide, part of the Libris Design Project (http://www.librisdesign.org/docs/FurnitureLibraries.pdf). Often support-ing a variety of electronic equipment, such as computers, video equipment, or audio listening devices, the carrels should be selected to complement other library furniture, particularly the tables. Possible design configurations are single-faced (one user) and double-faced with a shared central panel.

LIGHTING THE WAY TO KNOWLEDGE

Another extremely important building system for libraries is a well-designed, aesthetically pleasing, energy-efficient lighting scheme. Designers recommend a number of effec-tive strategies for achieving this. "General library lighting is best handled by a combination of direct and indirect sources," says PSA-Dewberry's Wrightson. "Skylights, light shelves, and clerestory lighting are all environmentally friendly ways to light library interiors, provided that they are designed to

Library of Congress Standards for Archival Records

Space	Temperature	Relative humidity	Particulate filtration	Maximum level of pollutants	
Stack areas where people are excluded	50°F +/-2.5°	30% +/-5%	90% removal of 1-micron particles	Sulfur dioxide	0.38 ppb
				Nitrogen dioxide	2.5 ppb
				Ozone	12 ppb

Source: http://www.greenguard.org/uploads/GEIDocs/GREENGUARD_KENDILLON.pdf

The Library of Congress has one of the most state-of-the-art storage systems in the world and some of the most stringent archive condition require-ments. Also recommended: best available controls for hydrochloric acid, acetic acid, and formaldehyde.

IES-recommended Light Levels for Libraries

Space	Recommended illuminance (in footcandles)
Active (occupied) book stacks	35 at top, 6 at bottom
Inactive book stacks	5 (at 30 inches above floor)
Book repair and binding	30
Cataloging	30
Circulation and reference desks	30
Computer areas	30
Audio-visual areas	30
Audio-listening areas	30
Reading (normal size and contrast: newspapers, magazines, keyboards)	30
Reading (very small size, low contrast: small print, fine detail)	50

Source: IES; U.S. Institute of Museum and Library Services, Daylighting Design in Libraries: http://www.librisdesign.org/docs/DaylightDesignLibs.pdf

Recommended light levels from the International Engineering Society of North America. For circulation and reference desks, note that many lighting designers recommend 40-50 footcandles.

minimize glare and heat loss."

RMJM's Rizzo sees continuous rows of indirect and direct/indirect fluorescent fixtures as one of the most efficient and effective ways to provide general illumination for both book stacks and reading areas. To supplement on the creative side, spot-source wall and material display accent lighting is a nice touch to draw attention to artwork and special collection items and add spark to the space.

BHDP's Sens likes to go with the more efficient T5 or T8 fluorescent lamps, specified between 3,000K and 3,300K, for a consistently warm light temperature level. Focusing in on the bookshelves, LPA's D'Amato prefers integrated lighting for better illumination, thereby reducing the need for ambient light.

The ultimate goal is to make the book titles and call numbers easy to read. As a guide, Edward T. Dean, AIA, a San Francisco-based lighting designer and instructor with the University of California, Berkeley's Department of Architecture, specifies in Daylighting Design in Libraries that the book stack lighting level be a minimum of six footcandles, measured vertically on the face of the book spine at a height of 12 inches above the floor, and a maximum of 35 footcandles at any height, so that no more than a 6:1 ratio results across the entire vertical face of the book stack.

To achieve more uniform lighting for general illumination, LPA's D'Amato likes integrating indirect lighting with ceiling reflectance. "Suspended indirect fixtures which reflect light off the ceilings or adjacent walls can typically provide better illumination with fewer fixtures and therefore less

energy use," he says. "By illuminating the ceilings and walls in a space, the space is automatically perceived as a brighter environment with better uniform lighting."

As a guideline metric here, Dean, in his Libris Design Project guide (http://www.librisdesign.org/docs/Daylight-DesignLibs.pdf), states that ideal brightness ratio levels are typically 10:3:1, with 10 representing the brightness of visual task, three the brightness of the immediate surround, and one the brightness of the general surround.

As for daylighting, while there are numerous strategies, D'Amato stresses the importance of starting at the beginning—proper site orientation. Once this is well established, high-performance glass, solar shades, awnings, and automatic dimming systems can be used to enhance the daylighting program.

In Dean's experience, continuously dimming systems, which respond to available daylight illumination levels, tend to be the most sophisticated type of controls. At the very least, basic daylight controls should be incorporated near the window areas; this, in fact, is a Title 24 requirement in the state of California. In particular, bi-level switching and separate light fixture control within 15 feet of exterior windows must be part of the design.

THE COMMONS AS RETAIL CENTER

While air and environment quality, a robust IT infrastructure, furnishings, and lighting are all important pieces of the puzzle, designers, library consultants, and owners must keep sight of the big picture—the ever-evolving library commons.

"No longer are libraries rigid and static as the combination of books, technology, and community space is changing the very nature of library planning," says D'Amato. "The library of today is taking cues from the retail world in both the visual aesthetic as well as the incorporation of more diverse media and community offerings."

Bringing in an even more futuristic view, in which the optimal blending of two worlds will occur, Mumby says, "We imagine a place where patrons can immerse themselves in both worlds simultaneously—a place where modular furniture allows users to create their own space, a place where distributed computer access provides ultimate flexibility; and a place where a mix of social media, online databases, and traditional formats allows users to migrate from traditional research to creating their own content."

DEGW's Felix, who consults on future library needs for his clients, holds a conservative outlook. "Where are libraries headed?" he asks. "Though there is uncertainty about new forms of media and communication, there are some things we can count on: People will still need places to accommodate their functional and emotional needs and promote chance encounters with others, with their environment, with information." **BD+C**