Lighting for Libraries

Lighting for Libraries. This material has been created by David Malman, Architectural Lighting Design, and provided through the Libris Design Project [http://www.librisdesign.org], supported by the U.S. Institute of Museum and Library Services under the provisions of the Library Services and Technology Act, administered in California by the State Librarian. Any use of this material should credit the author and funding source.

CONTENTS

1.	**THE PROFESSIONALS**	**2**
2.	**LIGHTING: BASICS**	**2**
2.1	Glossary	2
2.2	Basic Concepts	3
3.	**LIGHT SOURCES**	**3**
3.1	Introduction to light sources	3
3.2	Fluorescent Lamps	4
3.3	Incandescent Lamps	6
3.4	High-Intensity Discharge (HID) Lamps	7
4.	**LIGHTING FOR BOOKSTACKS**	**8**
4.1	Standards	8
4.2	Approaches to Stack Lighting	8
5.	**LIGHTING IN GENERAL READING AND STAFF AREAS**	**11**
5.1	Approaches	11
5.2	Options, Applications, Guidelines and Costs	13
5.3	Lighting for Service Desks	15
5.4	Lighting for Community Rooms	15
6.	**DAYLIGHTING**	**16**
7.	**EXTERIOR LIGHTING**	**16**
8.	**LIGHTING CONTROLS**	**16**
8.1	Occupancy Sensors	17
8.2	Exterior Lighting	17
9.	**ACCESSIBILITY ISSUES**	**17**
10.	**GOOD ARCHITECTURAL DESIGN**	**18**
11.	**FURTHER INFORMATION – LIGHTING FOR LIBRARIES**	**18**

Lighting for Libraries

"Quality lighting is a powerful tool than can greatly impact and enhance an architectural and interior design project." IALD

Reading is the most important task in libraries. Proper lighting is crucial to the overall success of a library. Good lighting design in library buildings is the result of both technical skill and art on the part of the designer. This is particularly true in newer buildings where visual tasks are more diverse and technology poses new types of lighting requirements.

The following text discusses the most important issues in lighting design for modern libraries. It is not an instruction manual on how to light a library, but it sets specific criteria that, if met, will avoid major mistakes. These criteria also can be used as a checklist for assessing the lighting in an existing library to see if improvements are needed.

1. THE PROFESSIONALS

The National Council of Qualifications for the Lighting Professions (NCQLP) offers certification to lighting designers who have passed a national exam. LC certification is an assurance that a designer is updating their knowledge of the technical, perceptual, and aesthetic issues in lighting.

2. LIGHTING: BASICS

2.1 Glossary

Lumen: Light energy is measured in lumens. One lumen is defined as the amount of light energy from a source of intensity one candlepower, incident on a unit area at a unit distance from the source. This is a property of the source of light; light bulbs sold in stores, for example, often indicate the number of lumens available from a lamp that draws a particular level of electric power (in watts).

Foot-candle: The foot-candle (abbreviated ft-c.) is a measure of illumination. One foot-candle is the amount of illumination provided by one lumen of light energy incident on a one-square-foot surface. If the same energy from a particular source is spread out over a larger area, such as four square feet for example, the illumination created by the source on this larger surface is reduced by a factor of four. Illumination, or foot-candle level, diminishes at distances further from the source of light. Thus books on the top shelf, near the lights at the ceiling above, have a higher level of illumination than the books on the bottom shelf.

2.2 Basic Concepts

Because foot-candle levels describe the amount of light available at a task, lighting regulations and standards are usually described in terms of this unit of measurement. Minimums are prescribed to enable different tasks to be accomplished, including reading or finding a building exit. Maximums are prescribed by energy standards to minimize the electrical demand of light fixtures. Neither guarantees good lighting design, which results from the artful balance of the various aspects of the quality of light and the avoidance of **glare.**

The factors that determine good functional lighting design in libraries include not only the amount of light energy available for specific visual tasks, but also the direction of the light relative to the eye, the brightness of objects surrounding the task object and within the field of view, and the surface reflectance and light-diffusing characteristics of the task object. **Glare** can result, for example, from light reflecting off a computer screen from overhead lights, bright light sources such as exposed light bulbs or even bright windows, or reflectance from glossy pages of a magazine.

Low glare lighting design is a principal objective of lighting design in libraries. For low glare environments the ideal ratios of brightness levels within the field of view are often described as 10:3:1, for the brightness of task (10) to brightness of immediate surround (3) to brightness of general surround (1). An environment that largely achieves these ratios can be considered to have a good level of visual comfort.

3. LIGHT SOURCES

3.1 Introduction to light sources

All electric light fixtures use fluorescent, incandescent, or high-intensity discharge light sources. These sources are technically known as "lamps" in the lighting industry; everyone else commonly calls them “light bulbs”. Each of these sources has advantages and disadvantages, and librarians should be familiar with the basic characteristics of each source so they can participate effectively in the lighting design process.

Daylight is also a light source, but because of its special characteristics, it is discussed as a topic in a separate article on the Libris DESIGN website.

Regardless of the light sources selected, the number of different lamp types used in a project should be minimized to simplify maintenance and lamp stocking. It is not necessary to restrict the selection of light sources to some arbitrary number, but a reasonable effort should be made to write specifications so that similar lamp types are consolidated into as few different types as practical.

3.2 Fluorescent Lamps

Fluorescent lamps produce light by passing an electric current through a gas inside a glass tube. The energized gas radiates its energy to a coating on the inside of the tube, and the coating, in turn, changes this energy into visible light. Fluorescent sources are efficient (that is, they produce a lot of light for each watt of electric power they consume) and they have very long life.

Fluorescent lamps are available in a wide variety of shapes and sizes.

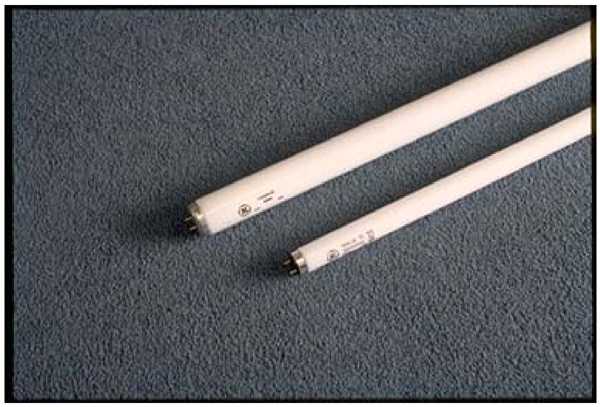

Illustration 1: T12 fluorescent lamps (left) have generally been replaced by narrow T8 lamps (right), which are more efficient and have an improved color of light.

- T8 lamps are 1" in diameter and are available in 2-ft., 3-ft., 4-ft. and 8-ft. lengths; these are the most-commonly-used lamps.
- T5 high-output lamps are a recent innovation: they are only 5/8" in diameter and are available in 2-ft., 3-ft., and 4-ft. lengths. T5 lamps produce more light than T8 lamps, but they have been generally more expensive and can produce source glare if not properly shielded from view because the lamps are very bright. T5 lamps should be used in indirect fixtures only, where the lamps are hidden from view.
- Compact fluorescent lamps come in many sizes and wattages; they are often used in small ceiling fixtures, wall sconces, and table lamps.

3.2.1 Lamp Color

Fluorescent lamps are available in warm (3000°), medium (3500°), and cool (4100°) color temperatures. The appropriate lamp color for each project should be selected based on viewing a mock-up of interior finish samples lit with the three lamp options. Many libraries use 3500° lamps that produce a neutral color light (not too pink, not too blue) that blends well with daylight. Some librarians prefer 3000° lamps that have a pinkish-yellow light that resembles the warm glow of incandescent lamps. This warm color is especially appropriate in historic buildings. 4100°K lamps have a bluish-white color; some librarians prefer this color, especially in desert climates, where the cool color of light may psychologically imply a cool relief from the hot exterior environment. It should be noted that the choice of lamp color has no effect on light levels or cost - it is basically an aesthetic choice.

Regardless of which color is selected, the light spectrum from standard fluorescent lamps provides adequate color rendering for the visual tasks in libraries. Color Rendering Index (CRI) is a technical measurement of the color-rendering characteristics of lamps, and it is different from the color temperature discussed above. Standard T8 lamps have a CRI of 75; some lighting designers like to use T8 lamps with a CRI of 82, which have a richer color but may be slightly more expensive. All T5 and compact fluorescent lamps have a CRI of 82.

Avoid "**daylight-color**" lamps; they don't really simulate daylight, and they are expensive and inefficient. Likewise, don't ask for "full-spectrum" lamps; these lamps, which have enhanced UV output and are claimed to have health benefits, might have some value in Scandinavia where it is dark for many months of the year, but in California they don't offer any strong advantages. Taking a walk at lunchtime, for example, is more beneficial than sitting under enhanced-UV lighting.

If replacement lamps for the library will be purchased on a citywide or countywide basis, it is worth coordinating the lamp color choice with standards that may exist for each city or county. A new library will start to look very odd if the jurisdiction buys only 3500° lamps as replacements for the 3000° lamps that were originally installed.

All fluorescent lamps contain a little bit of mercury to help start the lamp. Mercury is very toxic and spreads easily through the environment. Fluorescent lamps with reduced mercury content are available. The total amount of mercury released to the environment from the disposal of fluorescent lamps is very small compared to mercury released from other sources such as cars and power plants, but using low-mercury lamps adds little or no cost and has no negative impact on the lighting.

All fluorescent lamps require ballasts to start the lamps and regulate current while the lamps are running. Electronic ballasts from major manufacturers have a proven track record of reliability, flicker-free quiet operation, and significant energy savings; they should be used whenever possible.

Well-designed fluorescent lighting is the best "rule-of-thumb" choice for energy efficiency, good color rendering, and long lamp life in typical stack, reading, or staff areas with ceiling heights lower than approx. 15'-0". This should not preclude alternative designs using other light sources in non-typical areas such as large, high-ceiling public spaces, but these alternative approaches have many pitfalls and qualified lighting designers should develop them carefully.

3.3 Incandescent Lamps

Incandescent lamps produce light by passing an electric current through a filament; when the filament gets hot enough, it radiates visible light. Incandescent lamps are very inefficient and have relatively short lamp life, but they have a familiar warm yellowish color of light that is often associated with non-institutional environments.

Illustration 2: Incandescent PAR-lamps (left) and R-lamps (right) incorporate reflectors into the basic bulb shape to improve efficiency.

Tungsten-halogen lamps are special types of incandescent lamps that have a whiter color of light and somewhat-longer lamp life, but they are still relatively inefficient. (Note that tungsten-halogen lamps are often confused with metal halide lamps, which are discussed below under HID sources. Although the words "tungsten-halogen" and "metal halide" might sound similar, they are completely different light sources.)

In general, incandescent lighting should be avoided except in special situations because of its low efficiency and short lamp life. Incandescent or tungsten-halogen sources should be used only where no other source can meet needs for precise beam control, small fixture size, easy dimming, or historical accuracy. Some designers like to use a small number of incandescent lamps in lounges or lobbies to make the library feel less institutional.

3.4 High-Intensity Discharge (HID) Lamps

HID sources include **metal halide** lamps and high-pressure sodium lamps (see Photo 3). Both types of lamps produce light by energizing a gas inside the lamp. HID sources are energy-efficient and have long life, but until recently their color has not been very acceptable. Standard metal halide lamps have a bluish-white color; high-pressure sodium lamps have a pinkish-orange color that is often used in streetlights.

Although color is still a problem with high-pressure sodium lamps, improved-color metal halide lamps are now available. These lamps, called "ceramic-arc-tube lamps" have very good color that is similar to incandescent light. As these lamps become available in a wider range of sizes and wattages, they will become increasingly common in library interiors.

Illustration 3: Typical HID lamps

The high efficiency and small size of HID sources means that unless they are used in carefully designed fixtures, they can be objectionably bright glare sources.

3.4.1 Cons

HID sources, like fluorescent sources, require ballasts. Ballast noise in HID fixtures has often been a problem in libraries. Some metal halide lamps can be operated with electronic ballasts that are significantly quieter.

HID sources are often used in high-ceiling public spaces such as lobbies or main reading rooms because they can provide much higher levels of light over greater distances than fluorescent sources. They are also commonly used for exterior lighting.

HID lamps require a few minutes of warm-up time, so they should not be used in meeting rooms where the lights are turned off frequently for AV presentations or in rooms with occupancy sensors - when the lights are turned on, the long warm-up delay is very annoying.

HID lamps are the subject of ongoing research and product development that eventually will make these sources acceptable for general use in interiors, but for now their use should be carefully evaluated to ensure that their advantages outweigh their disadvantages in each situation.

4. LIGHTING FOR BOOKSTACKS

4.1 Standards

Bookstacks must be lit adequately so patrons can find books and also so staff can spend long hours shelving books without visual discomfort. Evenness of illumination across the stack face is more important than achieving a high lighting level at any single point. More specifically, the lighting level should be 6 foot-candles (ft-c) minimum measured on the stack face (that is, vertically) at a height of 12", and 35 ft-c maximum at any height to achieve no more than a 6-to-1 maximum-to-minimum ratio across the entire stack face.

Note: If a light meter is used to measure these illumination levels in existing stacks, the meter should be held in a vertical position, parallel to the spine of the book. The meter will then read the *vertical* foot-candle level, which is a true measure of the illumination of the book title in the vertical position.

For the design of new stack areas, standard lighting computer calculations should be used to demonstrate that these lighting requirements are met. In addition, the stack ends should be lit so "range" signs are visible.

4.2 Approaches to Stack Lighting

- “Parallel” scheme, where rows of linear fixtures are located directly above the stack aisles
- “Perpendicular” scheme, where rows of fixtures run perpendicular to the stacks and stack aisles
- “Indirect” scheme, where lighting is aimed upward rather than downward, and is bounced off the ceiling. The resulting light is diffuse and non-directional. Therefore, the light fixtures can be arranged in almost any uniform geometry above the stacks.

4.2.1 Parallel Scheme

The parallel scheme uses a single row of one-lamp linear fluorescent fixtures centered above each aisle. The fixtures can be recessed in the ceiling, suspended below the ceiling, or attached to the stacks. Ceilings are often made of acoustic tiles that are installed on a 2'-0" module, but stacks are installed on various spacing from 5'-0" to 6'-0" on-center, so it is often difficult to center recessed lights over the aisles without modifying the ceiling grid. The fixtures must distribute light evenly across the stacks, with adequate light reaching the bottom shelf and no dark areas at the top shelf. Attaching lights to the stacks may be the only solution in high-ceiling rooms where suspended fixtures would be visually obtrusive, but the mounting and wiring details for stack mounting can be expensive. Despite these cautions, the parallel scheme makes intuitive sense and has the potential to have the lowest energy use.

Illustration 4: Stack lighting runs parallel to the stacks at the San Francisco Main Library, and the lighting is very even from top to bottom of each stack.

4.2.2 Perpendicular Scheme

The perpendicular scheme uses rows of two-lamp linear fluorescent fixtures running at right angles to the stacks on spacing from 7'-0" to 9'-0" on-center. Because the lights do not need to be centered above the aisles, this scheme can easily be coordinated with the ceiling grid, and it works especially well above compact shelving where there are no fixed aisles. Although this scheme may be counter-intuitive to some people, it actually works quite well as long as there are no dark areas at the top shelf. The perpendicular scheme uses fewer fixtures than the parallel scheme so it may be the lowest-cost solution, but because each fixture has two lamps it may not have the lowest energy use.

Some designers try to combine the parallel and perpendicular schemes into a diagonal arrangement of rows, but this offers no real advantages and creates a visually distracting layout that is hard to coordinate with the ceiling structure.

4.2.3 Indirect Scheme

The indirect scheme uses up lights on top of the stacks or suspended from the ceiling. All of the light is reflected off the ceiling, so the illumination on the stacks is very soft, and the entire range of stacks appears to have a pleasant glow. If the ceiling is white and enough light reaches the bottom shelf, this scheme can work well. The energy use can be higher than either the parallel or perpendicular schemes, which could make it difficult to comply with the California energy regulations.

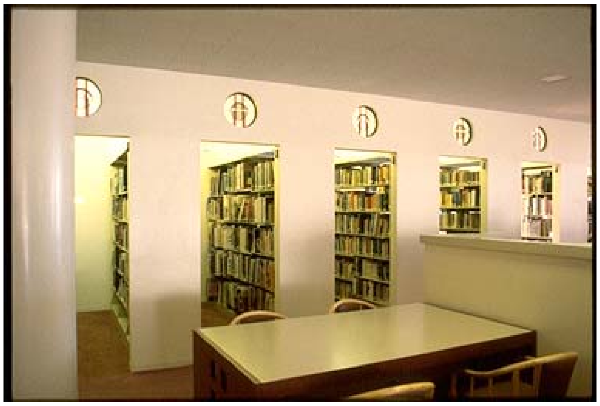

Illustration 5: Indirect lighting concealed on top of the stacks is used in a small library at University High School in San Francisco.

4.2.4 Hybrid Schemes

The perpendicular and indirect schemes are sometimes combined, with rows of direct-indirect fixtures suspended perpendicular to the stacks. When the ceiling is higher than approx. 10'-0", this hybrid scheme can be a very successful solution that provides good lighting on stacks at moderate cost and with reasonable energy use.

Illustration 6: Direct-indirect lighting runs perpendicular to the stacks at the Albany Public Library, and the lighting is very even across the entire stack face.

Outward-facing periodical shelves are especially difficult to light because the clear plastic protective folders on the magazines reflect any overhead lighting, which obscures the covers. No scheme is perfect, so it may be best to simply use whichever lighting scheme is used for adjacent standard shelving and live with the compromise. Building lights into the bottoms of the shelves is very expensive and is usually ineffective.

Regardless of which scheme is selected, fixtures should not be located higher than approximately 15'-0" above the floor, because this is the highest height that can safely be reached for re-lamping purposes from a 12'-0" ladder that fits in the aisles. If it is necessary to hang lights higher than 15'-0", the designers should work closely with the library maintenance staff to develop a feasible maintenance system.

5. LIGHTING IN GENERAL READING AND STAFF AREAS

5.1 Approaches

General lighting needs to suit a wide range of activities, and it must be flexible to suit present and future tasks. Glare reduction is a primary concern, especially where computers are prevalent. The basic issues are indirect vs. direct lighting, and general vs. task lighting.

5.1.1 Indirect Lighting

Indirect lighting uses fluorescent or metal halide lamps to up light a light color ceiling; the resulting reflected light is inherently very soft, shadow-free, and low-glare. Indirect lighting works well for both paper-based and computer tasks in rooms where the ceiling height is at least 9'-6" and preferably more than 10'-0".

Illustration 7: Indirect lighting softly illuminates some of the reading areas at the Danville Public Library. Photo by Tom Rider.

5.1.2 Direct Lighting

Direct lighting uses down lights to illuminate the reading tables. The down lights can be as small as 6" diameter fixtures with compact fluorescent or metal halide lamps and parabolic cones, or they can be linear or rectangular fluorescent fixtures with parabolic louvers. The parabolic shape of the cones and louvers prevents seeing the lamps at shallow viewing angles and re-directs the light so it is less likely to be reflected in computer screens. The parabolic cones or louvers should be made of aluminum, not plastic, and they should have a "semi-specular" finish to reduce the visibility of dirt or fingerprints.

Illustration 8: Recessed fixtures with parabolic louvers provide low-glare lighting at the Sacramento Central Library.

5.2 Options, Applications, Guidelines and Costs

Direct and indirect lighting are often combined in suspended fluorescent fixtures that have a mostly-up light distribution and a small well-shielded down light component, approx. 80% up light and 20% down light. By adjusting the relative proportion of up light and down light, this type of lighting can be made to work even in rooms with wood ceilings. This is the current state-of-the-art solution and should be seriously considered for reading and staff areas in all libraries. The cost of indirect lighting is usually only slightly more expensive than a basic direct scheme using standard lay-in 2'x4' fixtures.

A lighting level of 30 - 40 foot-candles (ft-c) is adequate for general reading and staff areas. Providing a higher general light level costs more to build and to operate, and may not meet the California energy regulations. Instead of increasing the general lighting level, task lighting should be provided at some reading tables or carrels for patrons who may prefer or need a higher light level.

Table lamps, where provided, should be of very durable construction and should be designed to spread light evenly across the work surface. In public areas, they should be securely mounted to furniture and should not obstruct the librarian's view across the room.

Illustration 9: Table lamps must light the table evenly and be very sturdy. The base of these lamps at the San Francisco Main Library also includes power and data wiring.

Task lighting should be provided in all staff workstations. Movable lamps are best because they allow users to adjust the lighting to their needs, but generic under-shelf fluorescents are adequate. A general light level of 50 ft-c should be provided over book sorting and worktables. Because these areas need ample open unobstructed space, task lights are not very practical.

Illustration 10: Although recessed 2’x2’ fixtures with parabolic louvers can provide low-glare lighting for reading tables, they do not light the perimeter of the space very well.

Regardless of the lighting level on work surfaces, walls in public areas and staff work areas should not be left completely dark. Continuous "**wall washing**" is not required, but dark areas on perimeter walls should be minimized where this is consistent with the architectural design. Many types of program elements (bookshelves, bulletin boards, displays, telephones, work counters, etc.) tend to accumulate near walls, and flexibility will be increased if the perimeter is not left dark. In addition, a well-lit perimeter creates spatial definition and gives the entire space a feeling of brightness.

Illustration 11: With additional wall washers, the perimeter bookshelves are lit and the space feels brighter, even though the average lighting level on the tables is the same as in Illustration 10.

5.3 Lighting for Service Desks

Lighting at service desks must be adequate for paper-based tasks and it must not cause reflected glare in computer screens. In addition, the lighting should be very comfortable because staff members may spend most of their working time at a service desk.

The lighting level should be 40 - 50 foot-candles (ft-c) on the desk. This can be achieved through a general lighting scheme or by providing approx. 30 ft-c of general illumination and additional task lighting at the portions of the desk where paper-based tasks are performed. The lighting should be located so it does not cause glare on computer screens. This is very difficult to do if the screens are recessed into the desktop. If down lights are located above the desk, they should have lenses or diffusers to soften the light that occurs directly over the librarian's or patron's head.

Illustration 12: Lights at service desks should be positioned so they do not reflect in computer monitors.

5.4 Lighting for Community Rooms

Large meeting or community rooms should have 30-40 ft-c with all lights on, and separately controlled lighting for the podium or front of room. The lighting should be dimmable or switchable to produce approximately 5 ft-c for note taking during AV presentations. The note-taking light should not spill onto the projection screen. To give flexibility, there might be several different types of lighting in the room (down lights, coves, sconces, perimeter lighting, etc.) that can be combined in various ways to suit different activities. Because the walls are often used for displays, separately controlled wall washers or track lights should be provided around the perimeter.

Controls should be kept very simple and easy for an untrained person to use. The tendency is to provide more flexibility and complication than is needed, which often results in broken controls and frustrated users.

6. DAYLIGHTING

Effective use of daylighting can reduce energy consumption and make the library feel more human and less institutional. However, uncontrolled daylighting can be a source of glare and can damage sensitive materials.

North-facing windows or clerestories admit daylight while excluding direct sunlight. South facing glazing with adequate overhangs can also be effective. Where direct sun is allowed to enter reading areas, adjustable window coverings should be provided.

Ultraviolet (UV) is the most damaging wavelength of light; any light can cause cloth, paper, and ink to degrade over time. Windows and skylights should be provided with window coverings or located so direct sunlight does not reach the stacks or other sensitive materials.

Note that fluorescent light sources are also a source of UV light. Costly UV filters for the electric lights are not necessary, however, except in archival and rare book collections. Even there, an indirect lighting scheme may not require filters because the ceiling absorbs a lot of the UV light. When filters are used, a regular replacement schedule must be implemented.

Daylighting should be integrated with a dimmable or multi-level lighting control system so the lighting is automatically adjusted in response to available daylight, and electrical energy savings are possible as a result.

Note: Daylighting in Libraries is treated as a separate building topic on the Libris DESIGN Website.

7. EXTERIOR LIGHTING

Parking areas, steps, ramps, paths, plazas, doorways, and potential hiding places should be adequately lit for safety and security. Specific light level criteria should be selected to suit each particular situation. Consideration should be given to exactly what needs to be lit: for example, steps or ramps require light on the walking surface, but pathways, plazas, and parking lots may require light on people's faces to promote recognition, identification, or a sense of security. If a library is located in a residential neighborhood, exterior lighting should limit light trespass onto adjacent residential properties.

8. LIGHTING CONTROLS

Lighting circuits should be turned on and off by a control system that allows flexible timed programming for each circuit. There should be a master control station at the main circulation desk for manual override of groups of lights or to allow some lights to be turned off just before closing time as a signal for patrons to leave. A programmable system is often included in an overall Building Energy Management System (BEMS) that controls lighting and HVAC loads in large buildings. In small libraries, the lighting controls may consist of a row of switches at the main circulation desk.

Carrel lights, table lamps, and other task lights should be fed from circuits controlled by the lighting control system so they turn off after the library closes.

Lights near windows or skylights should be switched separately from other lights. Consider dimmable electronic fluorescent ballasts and photocells for areas that receive significant daylight. Some electronic ballasts can dim fluorescent lamps automatically in response to daylight sensors, producing corresponding energy savings. Fluorescent dimming should be evaluated based on a review of higher initial cost vs. future estimated energy savings to see if it is cost-effective.

8.1 Occupancy Sensors

Occupancy sensors are a simple way to reduce energy consumption in areas that are not in continuous use, such as storage rooms, electrical closets, mechanical rooms, private offices or meeting rooms. Turning lights on and off several times a day with occupancy sensors will not shorten lamp life very much, except for preheat-type compact fluorescent lamps. Do not use occupancy sensors in toilet rooms or compact shelving areas.

8.2 Exterior Lighting

Exterior lighting should be controlled by timers and photocells so most exterior lighting turns off after the staff leaves and a small amount of security lighting remains on all night.

9. ACCESSIBILITY ISSUES

- In walkways, halls, corridors, passageways or aisles, no portion of a wall mounted light at a height of between 27” and 80” above finished floor should project more than 4” from the wall.
- In elevators, the minimum light level on the floor and on the controls should be 5 ft-c.
- Controls should be mounted no more than 48” above finished floor. Revisions in the California State guidelines may lower this to 42”.

10. GOOD ARCHITECTURAL DESIGN

Although lighting levels are easy to measure, producing these lighting levels alone does not guarantee that the lighting will be successful. The lighting design must fulfill needs for glare control, spatial definition, orientation, and variety, and these may have more bearing on the perception of "good lighting" than achieving certain lighting levels. Many well-loved libraries do not have 30 ft-c of general light, but they are successful because the lighting and architecture work in concert to create pleasant environments.

11. FURTHER INFORMATION – LIGHTING FOR LIBRARIES

Societies and Organizations (Most of these have websites)

IESNA	Illuminating Engineering Society of North America	*www.iesna.org*
IALD	International Association of Lighting Designers	*www.iald.org*
NCQLP	National Council of Qualifications for the Lighting Professions	*www.ncqlp.org*
NEMA	National Electrical Manufacturers' Association	*www.nema.org*
NFPA	National Fire Protection Association	*www.nfpa.org*
ASTM	American Society for Testing and Materials	*www.astm.org*

Publications (Many of these are in print)

Crow, Sherry R. Library Lighting. Pieces of Learning, 1990.

Guzowksi, Mary. Daylighting For Sustainable Design. New York: McGraw Hill Professional Book Group, 1999.

Illuminating Engineering Society. Handbook. (latest) Source for lighting level recommendations.

Lechner, Norbert. Heating, Cooling, Lighting: Design Methods for Architects. New York: John Wiley & Sons, 2000.

Library Lighting: A Primer for Librarians. Meyer, Scherer & Rockcastle. Minneapolis, MN, c1996.

Rossini, John. Library Lighting: A Bibliography Of Periodical Literature And Monographs. Vance Bibliographies, 1987.

Scherer, Jeffrey. *Light and Libraries*. Library Hi Tech. Volume 17: Number 4. 1999.

Steffey, Gary R. Architectural Lighting Design. New York, John Wiley & Sons, 1997.

12. CONTRIBUTORS

Architectural Lighting Design

David Malman
Architectural Lighting DESIGN
370 Brannan Street
San Francisco, CA 94107
Phone: 415 495-4085
FAX: 415 495-4660
dmalman@aldsf.com