Here's To Your Health

SEVEN KEY ELEMENTS TEND TO DRIVE HEALTHCARE LIGHTING DESIGN, WHETHER THE SPACE IS A MATERNITY WARD, NURSE'S STATION OR ANYTHING IN BETWEEN

Exam level lighting is emphasized in critical care areas. At the Morgan Stanley Children's Hospital of New York Presbyterian, dimmable indirects provide flexible illuminating levels of 1 fc to 75 fc. T5HO cove lighting is also fully dimmable. Photo courtesy EwingCole, by Peter Paige.

By Mary Alcaraz
Brian Hahnlen

As designers of healthcare lighting, we must fulfill many needs, but most importantly the needs of the patient. We strive to create lighting for spaces to promote healing and a sense of well-being. If our lighting can influence the way patients feel in a positive way, we have succeeded.

There are seven significant elements that drive the design of lighting for healthcare spaces. What follows is a summary of each "design driver" and a look at how they are applied in a wide range of healthcare spaces.

Design Drivers

Patient Comfort. Patient comfort is a critical element in the design of healthcare spaces. The patient is the client of the healthcare system and therefore the main focus for the lighting design. A good lighting design will psychologically encourage the healing process. Important aspects of patient comfort come from design ideas such as:

- *Home-like Atmosphere.* Designs have evolved from the typical hospital built in the '70s and '80s, which were sterile environments. Today, a more common design philosophy is to bring the look and feel of the patient's home environment to the institution.
- *Visual Interest.* Visual interest will stimulate a patient's moods in a positive way. Lighting can be a tool in creating this visual interest by creating contrasts and accents in areas not typically associated with purely functional hospital lighting.
- *Daylight Access.* Access to daylight is extremely important for the patient's health and well-being. Plan for access to views and daylight wherever possible. Of course, access to daylight is required for many patient spaces such as patient rooms, in the codes and design guidelines.
- *Elimination of Glare.* Elimination of glare is a factor in all well-developed lighting designs. However, in hospitals, glare sources are more abundant than they would be in other instances. Patents spend a significant portion of time in beds and stretchers looking directly into luminaires. Lamps from parabolic luminaires or brightly lensed troffers in corridors and patient rooms are distracting. Indirect lighting is often preferable in these instances.

Medical Staff Demands. Illumination of tasks for the medical staff is equally important as patient comfort. Critical tasks, such as exams and procedures, require a high quality of illumination with adequate color rendering. A functional lighting design will assist in accelerating the healing process. The functional demands of the illumination systems must also be seamlessly incorporated into the aesthetics of creating environments tailored for patient comfort.

Lighting for the observation of patients and staff demands at nurse's stations is often easier to accommodate. The functional aspects of the lighting design can be focused on due to the less critical nature of patient comfort in these areas. Flexibility in control implementation is often a technique used to meet the various illumination requirements for each space. The ability to utilize the same sources for both examinations and general lighting will also reduce visual clutter often associated with hospitals.

Aesthetics. Lighting should be designed in concert with the architectural and interior design aesthetics. It's important to the aesthetic feel of a hospital that the lighting be an integral part of the overall design so it does not look "applied" afterwards.

Lighting systems designed with aesthetics will succeed at the following goals:

- Lighting will be used to convey the visual meaning of the space.
- Lighting will aid in "way-finding" through use of geometry, brightness and color.

In this lightscape rendering, indirect lighting is integrated with architectural elements to create a pleasant environment.

- Lighting will delineate important architectural elements.
- Lighting will evoke emotion and create a mood.
- Lighting will de-institutionalize the space.

Budget. Budget in healthcare is always an important consideration. Establish the lighting budget required early in the process to achieve the desired design goals. Remember to include a budget for dimming and controls. Communicate with all involved in the project—architect, interior designer, electrical engineer, construction manager and the owner—so that everyone understands the budget. This will aid in warding off "devalue" engineering attacks later.

Energy Efficiency. Energy efficiency is important on every project, but can be even more important in healthcare occupancies, where it has not always been a top priority in the past. Most facilities are already aware of and utilize state-of-the-art lamp and ballast technology. Many older hospitals have even contracted with ESCOs to upgrade all of the lamps and ballasts on their campuses. However, state-of-the-art controls are often a less familiar means of energy conservation. Occupancy sensors are a must for 24/7 operations where savings can be realized in spaces utilized intermittently. Building-wide automated controls should be utilized in ambulatory care centers, where operations are not 24/7.

Many states have adopted the latest ASHRAE/IESNA 90.1 Energy Code. Meeting these requirements is a pre-requisite for LEED certification, which is an emerging trend in the healthcare market. Exceeding the ASHRAE 90.1 criteria whenever possible will also gain additional points in the LEED rating system. Daylighting, in addition to being important to patient's health and well-being, can be utilized for daylight harvesting. The ability to automatically turn off the lighting systems when adequate daylight is available is yet another way to maximize energy efficiency.

Maintenance. Facilities personnel are concerned about minimizing maintenance costs, and quite often they will have a lamp standardization chart. The following are important considerations in creating a design that can be easily maintained:

- Utilize long-life lamps.
- Consolidate the number of different types of lamps (to reduce re-stocking types).
- Locate luminaires so that they are easily accessible for re-lamping.
- Educate the owner and maintenance staff on the benefits of a group re-lamping program.
- Consider ease of cleaning in luminaire selection. Regular cleaning of luminaires is required to maintain a sterile environment.

Emergency Lighting Systems. Life safety requirements are typical to other facility types, but must be circuited separately from any additional emergency lighting, dedicated to the "life safety" emergency system distribution.

Emergency lighting that is required in addition to life safety lighting is entitled "emergency critical lighting" and is circuited to the "emergency critical" emergency system distribution. Emergency Critical lighting includes operating room lighting, task illumination at nurse's stations, patient rooms, and critical care areas and is outlined in the NFPA 70, National Electrical Code Article 517. In addition to emergency lighting backed up from the facilities generator system, in some cases such as for operating rooms, additional battery back-up is also required to maintain lighting for the 10 seconds between loss of normal power and transfer to the emergency system.

Applying the Drivers

Each of the seven design drivers should be considered throughout all spaces in the facility. High drivers and low drivers for typical and specialized healthcare spaces are illustrated in **Figures 1 & 2**. General con-

FIGURE 1

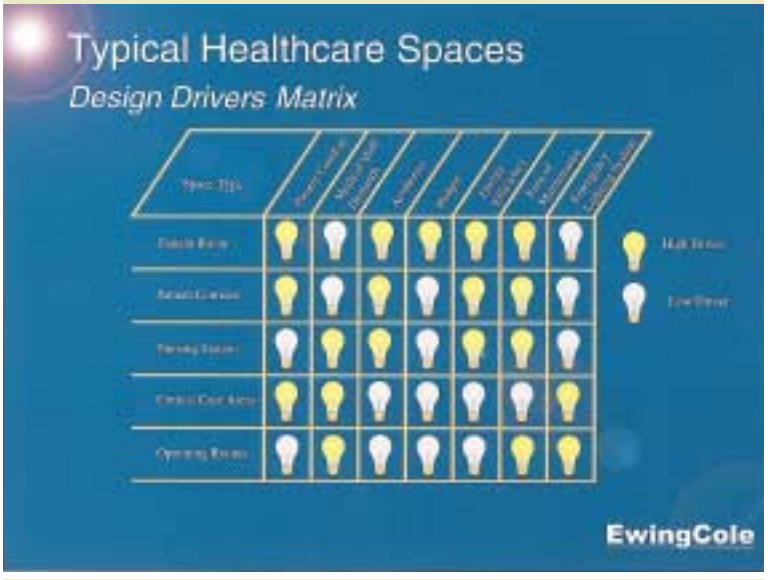
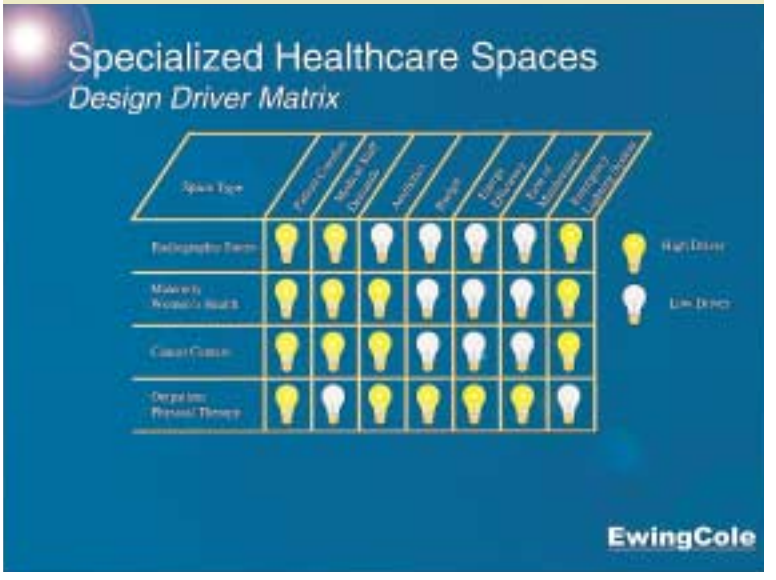


FIGURE 2



At the Morgan Stanley Children's Hospital of New York Presbyterian, the public and patients are enticed into the lobby with bright lighting that highlights the artwork of Sol Levitt.

PHOTO COURTESY EWINGCOLE, BY PETER PAIGE.

siderations for several common space types are outlined as follows:

• *Patient Room.* Balancing the needs of several users—patient, nurse, doctor, and housekeeping—and striving for patient comfort and a non-institutional feel requires close coordination. A variety of illuminance levels are required to meet the varying needs. Access to daylight is required by codes for patient orientation to day/night cycles. Controls need to be easily accessed by the patient and simple to use, which can be accomplished utilizing the nurse call system pillow speaker or built-in bed controls.

• *Patient Corridor.* To be successful, lighting for the patient corridors should be integrated with the architectural interiors to create a sense of place. Many times this will incorporate a theme in which the nurse's stations are incorporated in the design. Because patients are often transported on stretchers, the use of indirect lighting aids in the reduction of glare and promotes patient comfort. Lighting should be controlled/dimmed, even in a 24/7 operation, for day-time/night-time awareness and energy savings.

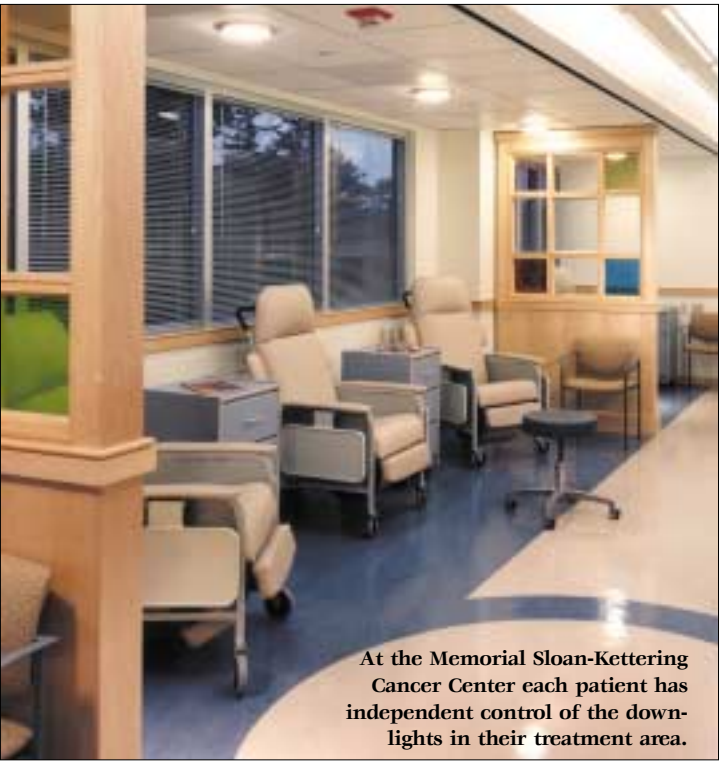
• *Nurse Stations.* There has been a trend in healthcare towards decentralized nursing, to eliminate or reduce the size of a central station in favor of several small nursing sub-stations. This trend often lends the design of the lighting in these areas to be integrated with the corridor lighting. Of course, the lighting should be sensitive towards the use of VDT's, with low glare task lighting.

• *Critical Care Areas (ICU, ERs, post-op, isolation rooms).* Lighting concerns for the critical care areas are similar to that of a patient room, with more emphasis on the functionality of exam level lighting. In these areas, ambient illumination as well as exam illumination levels is required, however the lights are often controlled more by the medical staff than by the patient.

• *Operating Rooms.* Uniform illumination is required for operating rooms, with high illuminance levels and low luminance ratios as outlines in the IES RP-29-95. The majority of O.R.s utilize six lamp T-8 lensed surgical luminaires, arranged in a rectangular fashion around the table. The layout of these must coordinate with the laminar flow diffusers, and with supplemental surgical lights provided with the medical equipment package. The majority of the lighting is typically fed from the emergency critical distribution system with some lighting connected to the normal lighting system as a back up in the event of an ATS failure. Battery backed-up lighting is also required, so that there is constant illumination in the event of a power failure. Radio frequency filters should be provided on the ballasts for EMI mitigation. Three level switching is typical with a ballast provided for every two lamps in each luminaire. High color temperature, high color-rendering sources are typically required.

• *Radiographic Suites.* A high degree of flexibility is required in radiographic suites. Dimming and dual level

PHOTO COURTESY EWINGCOLE, BY JEFFREY TOTARO.



At the Memorial Sloan-Kettering Cancer Center each patient has independent control of the downlights in their treatment area.

switching levels are a must. Lighting designs should be sensitive to patient comfort and patient anxiety. If surgical task lighting is required, it is typically provided with the medical equipment package. Non-fluorescent, tungsten halogen lighting is sometimes required by medical equipment vendors to limit any potential interference with medical equipment from fluorescent ballasts. MRI rooms typically have requirements for non-ferrous materials to be utilized in the spaces, and non-ferrous luminaires need to be specified.

- *Maternity/Women's Health.* Lighting designs for labor delivery rooms and labor delivery postpartum rooms are typically very home-like. Downlights and sconces, or built-in millwork lighting, typically utilized for general lighting, are used in conjunction with exam/procedure lights often designed to be camouflaged as a ceiling tile when not in use. Nurseries and NICUs should be designed with indirect lighting systems and full-range of dimming control to limit direct UV light to the babies.
- *Cancer Centers.* Lighting is of particular concern in cancer care environments where sensitivity to patient comfort and anxiety is paramount. Lighting can promote a relaxing and calming environment. Incorporating daylighting and views to the outdoors, especially in waiting and infusion areas, is recommended.
- *Outpatient Physical Therapy.* Creating a bright atmosphere is important in out-patient physical therapy environments. The use of indirect lighting and/or daylighting is recommended. Uniform, bright light will provide pleasant spaces for physical therapy.
- *Children's Healthcare Spaces.* Particularly in children's healthcare spaces, it is important to introduce a themed environment. Keep in mind at all times that the patients are children. The aesthetic design of spaces is important to reduce the institutional perception of a hospital to a child. Any whimsical, fun lighting schemes that can be incorporated are a plus.
- *Senior Living.* There has been a great deal of research of the aging eye in the past decade. The IES RP-28-98 is an excellent guide to lighting for senior living spaces, but local requirements and state codes must also be reviewed. Higher levels of illumination are required for seniors. Uniform, low glare lighting is equally essential.

However, it is often a challenge to provide indirect, home-like lighting systems on the usual low-budget these projects have. Consult early with the architect, mechanical and structural engineer, especially on new projects, so that floor-to-floor heights and mechanical systems do not limit the capability for indirect lighting.

Night lighting in the resident rooms needs careful consideration, so residents can find there way to the bathroom. Some states require night lights in the bathrooms, which again is recommended for all projects if the budget allows.

Some thought needs to be given to the typical evening levels of illumination, because uniformity is still an issue in the middle of the night if a senior is walking about. For this reason, and if your budget allows, a dimming system is a wonderful solution.

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