The continued renewal of architecture comes from changing concepts of space...the large spaces, the small spaces, the unnamed spaces, the spaces that serve ...The way they are formed with respect to light is the problem of all buildings. — *Louis Kahn*

HEALTHY LIGHTING

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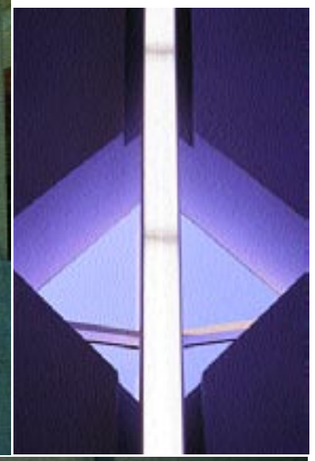

The architectural genetics of lighting design that reflect concept, statement, perception and image are clearly demonstrated in a Gunn Levine Associates' project recently completed at Garden City Hospital in Garden City, Michigan. The experience between perception and substance is absorbing. Relationships between light and form are convincing and effective. The creative use of natural and artificial lighting is manifest.

Structure defines physical order. Space characterizes psychological order. And light spawns the realization of visual order. Spatial experience is umbilically connected with the experience of light. Spatial relationships are perceived in light. The substance of space is shaped by light. The quality of space is transformed by light. Light is a compelling formgiver. The relationship between an image and the perception of that image is determined by light. Without light there is no vision. Without vision there is no visible space ... no light, no sight.

In the design of space, for various activities, the architectural statement is a spatial concept that may be largely influenced by function, that form ever follows. In the design of a sanctuary the architectural statement is a spatial concept related to an atmosphere that obviously nurtures belief held through faith, in which form and function are inseparable. In hospital design too, the architectural statement is a spatial concept related to human activity in which form and function are inseparable. Let's consider lighting as it pertains specifically to hospitals and the healthcare industry.

Lighting can be used to induce a mood and create ambience for the variety of spaces in a healthcare facility. Effectiveness versus program and relevance versus regulation are typical challenges we use to measure value; these criteria affect design. Abstract numerical criteria does not necessarily distin-

■ ***Above Left*** Emergency entrance/daytime, *Structure defines physical order.* ***Lower Left*** Emergency entrance/nighttime, *The quality of space is transformed by light.* ***Lower Center*** Lighting and interior details at reception area, *Light conspires with form to produce spatial phenomena.* ***Lower Right*** View into waiting room from outside, *Lighting design should be deliberate.* ***Above Right*** Detail of skylight and luminaire at Ambulance Dock, *Light is a compelling formgiver.*

guish between desirability and tolerability. According to the numbers, some things we have to emphasize may limit some things we might want to emphasize. We have to understand the theories and techniques to provide quality solutions to support the core values of healthcare institutions: taking care of patients, providing for their safety, comfort and dignity, and possibly offering some diversion from their pain.

The characteristics of lighting design, include technical, visual and conceptual components that represent intellectual mechanisms to describe the how of illumination. Designers should focus on the visual environment, visible colors and brightness, emotional and aesthetic values, and perceptions that may be more felt than measured. Light is a symbolic element of architecture that can dazzle, excite, or produce comfort and well-being. Our focus is on the what and the why of lighting design, on the instinctive emotional ingredients, the soft stuff, the fuzzy factor, things not easily measured. Our connections with light are emotionally based. Our response to lighting is more sensed than specific. That's why the average patient will not remember the lighted vaults and coves; rather, they will remember how they felt in that place.

Lighting design, particularly for hospitals, should to be deliberate. A current approach in healthcare design is patient focused care with de-institutionalization as an objective. But, that snug, homey, perhaps untidy method is not necessarily the ideal for care buildings. People who need care also need clear, reassuring, social structures to guide them in their time of stress. There are difficulties and obstacles to confront. There are bonds to be linked between the institutional and the human context, both in the larger sense of institution, and in the particular sense of its parts, such as patient and treatment rooms, surgery, emergency, nursing station, etc. Design is basic to expressing the intention, and lighting is basic to making the connection. Again, remember that the average patient will not remember the lighted vaults and coves; rather, they will remember how they felt in that place.

Lighting design considerations should reflect occupant or activity needs. The anatomy of a hospital shows it to be a very complex institution, with infinite functions carried out by normal and sick people alike. Tasks for each may be routine or meticulous, simple or complex, and could require subdued or high levels of illumination. Corridor lighting calls for 20fc in general nursing areas during the day and 10fc at night. Patient room lighting is generally straightforward with lighting levels ranging from 3fc for nightlighting to 100fc for examination, with a level of 30fc suitable for most routine activities.

Lighting levels for different activities are indicated by building codes and regulatory agency rules in footcandles. Example requirements may call for 2500fc in an operating room, 100fc in an exam room, 5fc in the parking lot, and so forth. More important characteristics in healthcare lighting are color temperature and color rendering. Color temperature is a measurement of the energy radiation of individual colors expressed in degrees kelvin. Color is the effect of light waves bouncing off or passing through an object. Color rendering is not a physical property of the object. The Color Rendering Index (CRI) systematically indicates on a scale of 1 to 100, how well a light source renders colors compared to the sun.

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A very important function that light can offer, in addition to providing the proper level of illumination is to accurately render natural skin tone. Lamps with high color rendition are necessary for visual triage, enabling the diagnosis of a condition by observing a patient's skin tone. Red could be an indicator of high blood pressure or of congestive heart failure. White could profile a patient in shock. Blue could signify cyanosis or a lack of oxygen. A yellow cast could identify jaundice. Green has another connotation. Light quality and efficiency are necessary for physical exams. Quantity, location, and color rendering are significant criteria. Lamps with a CRI of 80 to 85 or better, and a color temperature range of 3000 to 4000K are very acceptable.

A good luminous environment is reasonably described by words such as comfortable, pleasant, relevant and appropriate for its intended use. In addition to activity needs for visual information, biological needs must be addressed. The luminous solution should speak equally to individual priorities for reassurance, uplift and mood altering, while supporting the healthcare environment. A fundamental objective is to create an atmosphere that encourages patients to be more comfortable within patient rooms, treatment areas, and transportation. And again, the average patient will not remember the lighted vaults and coves; they will remember how they felt in that place.

An inviting environment for outpatients is vital. Outpatient visits are often prompted by personal preference. Future discretionary visits can be stimulated by appealing surroundings. It's a business issue. Natural light is key in providing a pleasant inviting atmosphere. The question is, what time of day is natural daylight? Is it clear or cloudy, light or dark? Is the daylight introduced through clear or tinted glass? Is it bronze? Gray? Blue? Green? Nevertheless, the effect of daylight is beneficial even if it is not exploited as a light source; it tends to increase occupant satisfaction.

Lighting is an inherent part of the architectural vocabulary. The relationship between lighting and form is alive and variable. Light conspires with form to produce spatial phenomena. Spatial experience is inherently connected with the experience of light.

Building spaces become designs in light. Columns, beams, arches, and other elements of structure and geometry are characterized by light. As it enters and transforms space, natural light begets mood by subtle as well as dramatic nuances relative to the time of day, the time of year, and environmental conditions. Light is sculpture. Light is a formgiver. Light becomes architecture.