ILLUMINATION and INTERIOR DESIGN

(Lighting Symposium in Karachi, 1982)

By

Danish Azar Zuby MCSD
Interior Design Consultant

Before I start my discussion I would like to make a little clarification regarding our topic. If we are considering illumination and interior decoration our coverage would be very limiting i.e. reflectance values of applied finishes, colour rendering of lamps and nature of luminaries etc. but, I assume, that the discussion actually demands more elaborate and comprehensive understanding of illumination in regard to total interior environment and therefore our topic would be illumination and interior design.

Usually interior decoration is confused with interior design. Interior decoration is a branch of interior design, it deals with finishes like paints, wallpapers, fabrics and carpeting, colour scheming etc., while interior design concerns with total interior environment i.e. internal climate control, acoustics, illumination, planning, furniture and fixtures, graphics, special effects and structural changes if need be. In some I European countries it is still termed as interior architecture. Unfortunately, there are not many professional interior designers in our country and the interiors which need serious attention are being designed by architects.

It is true that most outstanding interiors are designed by architects, but it is wise to accept, that the architect is burdened with such a serious responsibilities of providing us a total building, living and working forms, he is so engrossed with the structure that it is not possible to pay great deal of attention to the interior environment, hence a specialist is needed for a proper interior job. If we look at our building industry, it is quite depressing to note that generally, buildings are mass produced on the basis of blind commercialism with no regard to the living patterns of its inhabitants, or civic sense. They are not designed to changes or improve the life style or make it more comfortable. The irony is that we tend to live with it instead of a protest.

Thus we are left with rigid planning and services – which includes lighting. Obviously the buildings are not designed in collaboration with interior designers or even to the needs of changing owners or occupants.
Mostly new occupants takes the existing lighting design for granted and tries to adapt – but if he tries to redesign lighting to his needs – it is a great expenditure, anyhow, let us first examine light in the history of built environment so far.

It is generally understood that our planet is bombarded with infinite energy day and night from outer atmosphere in the form of electro-magnetic vibrations of various wavelengths. Amazingly, light is only a tiny part of this gigantic electro-magnetic spectrum and we experience it because that it is the only part visible to the human eye. For technical reasons the light is further split up and we get a rainbow of colours ranging from violet to red. Each colour has a different wavelength and a different effect on us. The visible spectrum ranges from 400 to 800 nanometer.

Life is just unthinkable without light. Since the birth of our planet it has helped to sustain various life forms, may it be vegetable, human or animal. It provides illumination, and necessary heat. It helps to define things by modeling and creating shades and shadows. It is the most striking element that distinguishes one space from another. Even the most precious diamonds and crystals and gorgeous silks and satins would be worthless if proper light did not reflect from them.

The Egyptians, Greeks and the Romans used light most creatively and produced one of the finest buildings in the world. The monumentality, the sculptures and the rich ornament has a perpetual quality. Light has played a major role in the creation of such masterpeices, mainly because of its modeling quality. 'Light architecture' a pre-gothic architecture utilized light in a very dramatic way for interiors. Small windows with deep jambs or niches diffused and filtered light into the interior most interestingly. Gothic churches employed light even more dramatically i.e. through the stain glass, the modeling quality of light was most used right till the renaissance and post-renaissance times as the exteriors were most sculptural and ornamental.

In the colder climates thinner walls were used and larger window openings in order to welcome light and heat. The industrial revolution changed the life styles tremendously and the architecture. Mass migration activated mass production, towns, became congested and buildings rose vertically. Elevations became simpler and direct. Construction methods changed, iron and glass was extensively used. Glass curtain wall was introduced. Wherever light was required, baffles or louvered elements were designed for the exterior and blinds and other masking, elements for interiors. The first electric light was lit in 1801 by Davy in England but it was not until 1879 that practical incandescent lamp was made by Thomas Edison. Soon thereafter various scientists started working on incandescent lamp in order to perfect it and make it for general use. It was only after the turn of the century that the incandescent lamps mainly with tungsten filament were commonly used. High levels of lighting were required in large box like spaces which resulted in considerable heat emission form the lamps adding to the summer heat. This made it necessary to provide for ventilation and cooling systems. Hence central climate control for interiors was sought for, which resulted in special constructions for ceiling and greater height in order to accommodate ducts and ventilated light fittings. This increased the cost of the buildings. It is also known that the illumination levels were low originally and quite inadequate for working conditions, a great deal of natural light was used through the windows, and electric light was only used to supplement the sunlight.

It was not until after the second world war that the fluorescent lamps were marketed which were 4 to 5 times more efficient and consumed considerably less electrical energy. This triggered a series of research agencies and scientists to look for alternatives in lighting, and to work for an "agreeable luminous environment" specially the C. I. E. Today we have with us research data which can enable us to calculate the required illumination level for any particular task or space – suggestions for correct lamps and luminaries for any specified levels and desired colour rendering.

It is worthwhile to mention here briefly how we react to and understand light. A source of light emits light radiations in all directions (unless it is directed), may it be sun, moon or a man made lamp. Light falls on an object and part of this light is reflected towards the eye of the observer. The eye focuses with its flexible lens and lets in the light to form an image of the object on the rear part of the eye called the retina. The retina is a screen wall composed of the famous 'rods' and 'cones' receptors. These two have the property of distinguishing form of the object by tonal differences and colours. Once there is a clear light image on the retina it is converted into electrical pulses and by help of ganglion cells via the optic nerve it is transferred to the brain. Here the information is stored and necessary signal is sent out for desired action. For example if you are looking directly at a light source the brain will register it and ask you to look away. The colour, intensity and direction of light are most crucial to form a correct image. A red coloured object would look like brown in a sodium discharge lamp. The object is characterized by its shape, texture and colour and when the light falls on it, it is absorbed, reflected or filtered, producing changes in the elements and hence defining the image clearly.

Now that we have discussed something about light behavior let us examine briefly how we can tame it to satisfy our requirements. I don't intend to go into the details of defining the "lumen method" or calculation of reflectance or wattage conversion into lumens.

However, there are four basic points of agreeable internal illumination, which are:

1. Sufficient light for a task
2. Good colour rendering
3. Correct direction of light
4. Absence of glare

These rules do not really mean a complete visual comfort because of various factors, for example – as a person's age increase, required levels of illumination increases. One could read, most comfortably, outside under a trees shade, where it could' be 10000 lux or more, but it's hard to believe that the same task can be performed inside most comfortably well under 300 lux.

Anyhow in a visual task the object should be crystal clear which is possible having the right luminance by choosing correct lamps, luminaries, with right colour rendering. Attention should be paid to shadows and reflections, the immediate and the total background. For mental work the background should not contain distracting patterns, bold colours, high contrasts or high brightness. Where the work needs very narrow visual field the object can be highly focused by making the background unimportant. For repetitive work, uniform brightness and attractive colours can be used. Large areas require even lighting but it tends to get monotonous, hence bold colour patches and high-lights can be used to create interest. It is always a good idea to save energy by incorporating daylight into the lighting scheme but without any discomfort such as glare etc.

Little things like using cool lights in a warm room can make subtle differences. Cool light, warm light refers to colour of the light emitted from a lamp in our colour spectrum where we have violet, blue, green, yellow, orange and red as pre-dominant colours. They graduate from cool to warm in the same order. The spectral composition of the light emitted from fluorescent tube shows that it is rich in blue side which has a rather cool effect. Incandescent bulbs show that they are rich in yellow and red colours.

Skin complexion looks paler in fluorescent and fresh with incandescent light. Green plants placed in an interior lose their freshness under fluorescent lamp, while look lively under incandescent. When high intensity light falls on a strong colour it always leaves after-image into the eye, even if you have to look at it for a short while. A yellow colour would leave purple spots in the eye which is opposite to yellow colour in the colour wheel. That is the reason why in many operation theatres a light green colour scheme is used, because looking at blood i.e. deep red, creates green spots in the eyes which could be confusing for a surgeon.

Directional lighting is generally an addition to general light sometimes used to emphasise texture or for modeling, sometimes to increase visibility of a task. Directional effect of the light can sometimes be intelligently avoided in order to conceal the defects of surface.

When creating shadows and contrasts, it should be understood that a small light source would create sharp shadows whereas a large source will bring shadows with soft edges. The distance of the light source is also important for shadows. If they are widely placed their directional effect tend to cancel out. Reflectance value of an applied finish is also important as the light from diffusing element strike the ceiling, walls floor etc. and is reflected back into the interiors. The reflected light depends upon the colour, texture or nature of the applied material. Light is absorbed, scattered, filtered, reflected etc. the incident light can considerably change in intensity, colour or nature after it is received from the applied finish. Dark walls or dark colours, or textured surfaces will reflect little light, while a white surface or glossy surface has great reflectance.
Glossy surface reflects image of a light source which is called glare. I think it is one of the most critical problems in the interiors as well in the outer world. It is fatal; it can impair vision, sometimes without a fore-warning people watch TV when windows or light sources are reflecting from the screen, which is quite disturbing. Glare and ceiling reflections occur usually when a light source, window or a very bright patch is

seen either directly or by reflections. I think we must design shapes, and elements to conceal direct light source, enclose light source into diffusing elements. The idea is to shield the lamps from direct vision by louvers, pelmets etc.

Glare from sky and the sun cause acute discomfort hence sensitive planning is necessary to avoid bright patches from the visual field. I strongly feel that matt printing inks and non-glossy printing papers should be used by the printing industry and gloss avoided wherever possible. Reading material or an object of interest should never be placed against a bright source. I will even say to the extent that great contrasts should be avoided in order to increase the life of our eyesight.

Before I end my discussion I would like to mention that though it is very much possible, from the research available to us that a very precise quantitative prediction of required light for a job can be made but I think there is a lot more to successful lighting design as far as visual environment is concerned. The lighting engineer and the designer should work in complete collaboration in order to design for the worker's comfort and a total visual environment.

Danish Azar Zuby, B.Sc., Dip. ID.
Member, British Institute of Interior Design
Member, Society of Industrial Artists and Designers, (England)

Saturday 9th October 1982