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"DESIGNING OF ILLUMINATION SYSTEM FOR COMMERCIAL BUILDING"

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Abstract—We all known that in India most of the spaces are either under light or over light, we are here to provide you a proper lighting solution with required light / lux levels and also keeping in mind the ambience.

Electric lighting accounts for a large share of energy consumption in commercial buildings. Utilization of daylight can significantly help to reduce the need for artificial lighting, increase workers productivity, customers' satisfaction and consequently improve sales.

A whole new lighting design system is proposed whereby interior lighting is designed for appearance rather than visual performance

AutoCAD is the most widely used drawing tool among the similar design drawing products. In the process of drawing different types of design drawings of the same product, there are a lot of repetitive and single work contents. The traditional manual method uses a drawing software AutoCAD drawing graphics with low efficiency, high error rate and high input cost shortcomings and many more. In order to solve these problems, the design of the parametric drawing system of the hot-rolled I-beam (steel beam) cross-section is completed by using the VBA secondary development tool and the Access database software with large-capacity storage data, and the analysis of the functional extension of the plane drawing and the parametric drawing design in this paper.

INTRODUCTION

A whole new lighting design system is proposed whereby interior lighting is designed for appearance rather than visual performance.

The purpose of lighting is to enable visual tasks to be performed efficiently and accurately. The purpose of lighting is to satisfy (or, better, to exceed) people's expectations for how lighting may influence the appearance of their surroundings.

The most important thing about a lighting design is that it is functional. Our lighting design team spend a lot of time with our customers to learn how they use their spaces so we can light them correctly

Lighting contributes the highest amount of electricity usage in a building. Generally, lighting will consume from 20% until 50% of the electricity consumption. The efficient and effective use of lighting can offer major energy and cost saving. This research investigates and analyses the energy management in a building and presents the design of energy efficient lighting systems. The first part proposes a design of energy efficient lighting which will help users to determine the ideal number of luminaries needed in certain room without reducing the quality of lighting. The design was developed via mat lab. The second part is an audit and cost study to demonstrate the wastefulness of commercial, industrial, residential and community lighting. Based on the study, the design for improvement of current lighting system called Lamp Replacement had been proposed. The major findings in this project are that the energy-efficient lighting design could still be achieved without sacrificing the visual comfort and quality of lighting and replacement of older fixtures with new luminaries can greatly improve efficiency. In INDIA most of the spaces are either under light or over light. We all know that lighting play important role while we designing any commercial building or any other building, many of the people's they want a good lighting in their building for good looking, decoration purpose and for luxury look, without wasting so much energy

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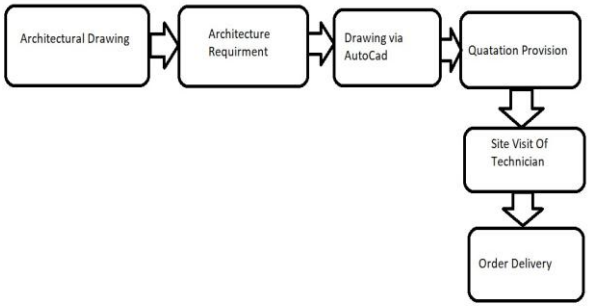

Fig 1 Block Diagram

We Generate the lead, lead generation through either Architecture or Interior Designer, builder or Direct end Client.

We Request the client to visit a showroom along with their fall ceiling layout. We seat and discuss with the client on the drawing understand their requirement and then provide a demo on our showroom floor.

We provide lighting design on AutoCAD based on the input provided by the client this layout consists of lighting location and selection of lighting product and provide legend with working drawings.

We also take into consideration the position of fan and AC with respect to our lighting layout.

Once the design is approved by the end client we provide our offer along with detail specifications of lighting product / Fixtures are Wise.

After the Negotiation the order is freeze and we pass on the all technical and commercial details to our execution team.

II. HARDWARE SPECIFICATIONS

Luminaries: -

For calculating lighting system basic design is the lumen method. General lighting requirement must be determined for that surface such as number of foot candles (lumen per square foot), room area, light loss due to room proportions, color of walls, coefficient of utilization and maintenance factor. The researcher shall utilize the 'lumen' manual calculations to compare these to luminaires (T5, T8 and LED) to illustrate the differences before utilizing the real time measurements and the computer program. The calculation can be seen in below figure.

$$\text{Luminaries, } N = \frac{A \times E}{F \times n \times MF \times UF}$$

Where:

A = Floor Area to Illuminate (m²)
N = Number of luminaire required (unit)
E = Required flux
F= Initial lamp lumen
n = Lamp per luminary
MF = Maintenance factor
UF = Utilization Factor

Table 1. Luminaries Required for Specific Area and Lamp's Lumen

Area, A (m^2)	Lamp's Lumen, F (lm)	Luminaries, N (units)
25	500	39
40	1000	25
50	1500	21
65	2000	20
80	2500	17
100	3000	17

Table 2. Luminaries Required for Specified Index

Dimension, L×W (m×m)	Room Index	Luminaries, N (Units)
10×10	2.08	18
12.5×8	2.03	18
20×5	1.67	20
25×4	1.44	22
50×2	0.80	29

Room Index (RI): -

The room index (RI) is the ratio between the surface of the working plane and the half surface of adjacent the walls. This indicates whether is narrow and high, low and wide. These influences the amount of light that is reflected to the working plane form the walls.

The room index need to determine first before proceed with coefficient of utilization. Below is the equation to determine the RI (Wan Northernizing et al., 2010).

$$\text{Room Index , } RI = \frac{L \times W}{H\,(L + M)}$$

Where,

L = Room Length (m)
W = Room Width (m)
H = Room Hight (m)
RI = Room Index

Utilization Factor (UF): -

The utilization factor indicates how well a lighting installation uses the luminous flux of the lamps. This is indicated as the ratio between the luminous flux that reaches the working plane and the light source of the bare lamps, expressed as a percentage.

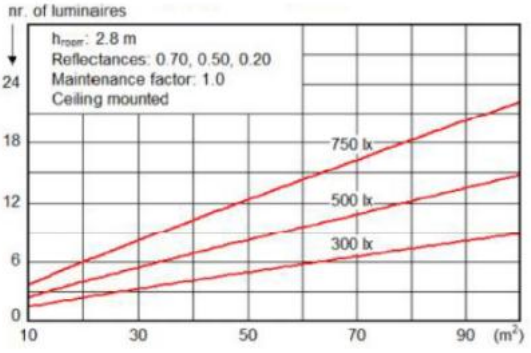

Fig. Quantity Estimation Diagram

Table can be referring from each data sheet type of lighting system at the appendices. By taking the value of reflectance 0.70, 0.50 and 0.20 and the value of room index (k) we can find the value of Utilization factor.

Utilization factor (UF) table also can be finding at each data sheet lighting system at the appendices. Example value of reflectance 0.70, 0.50 and 0.20 and the RI is 1.25 for T8 lighting system so the value of UF is 0.51.

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Colour Rendering Index (CRI): -

Colour rendering relates to the way objects appear under a given light source. The measure is called the "colour rendering index", or CRI. A low CRI indicates than objects may appear unnatural under the source, while a light with a high CRI rating will allow an object's colours to appear more natural. For lights with a "warm" colour temperature the reference point is an incandescent light. For lights with a cool colour temperature the reference is sunlight. The table below lists typical colour rendering index ratings for a variety of lights, including compact fluorescent light (CFL) bulbs.

Table 3 Colour Rendering Index

CRI		
22	high pressure sodium lighting	street lighting
62	common 4 foot fluorescent tube	office
80-85	compact fluorescent lighting (warm white)	residential
85	premium 4 foot fluorescent tube	retail
80-90	solid state LED lighting	residential
95	incandescent light bulb	residential

Uniformity: -

Uniform light and brightness levels across a space can be desirable but may also be boring; in such cases, sparkle elements, color and/or other methods can be employed to create visual interest without causing fatigue. Flicker or strobing of luminaires can cause annoyance as well as headaches and fatigue. This may be caused by fluorescent ballasts near the end of life or placement of 9 luminaires in relation to ceiling fans. If ceiling fans are required in a space, position the luminaires so that they are suspended below the level of the fans. Requirements for appropriate uniformity by followed IESNA uniformity criteria for specific areas unless superseded by other UFC criteria. Considerations for appropriate uniformity in office areas, uniformity should not exceed 5:1 in immediate work surrounds, and not including accent lighting. Exterior uniformity should not exceed 10:1 along areas of use including roadways, walkways, and parking areas.

III. SOFTWARE SPECIFICATIONS

AutoCAD: -

AutoCAD is the most widely used drawing tool among the similar design drawing products. In the process of drawing different types of design drawings of the same product, there are a lot of repetitive and single work contents. The traditional manual method uses a drawing software AutoCAD drawing graphics with low efficiency, high error rate and high input cost shortcomings and many more. In order to solve these problems, the design of the parametric drawing system of the hot-rolled I-beam (steel beam) cross-section is completed by using the VBA secondary development tool and the Access database software with large-capacity storage data, and the analysis of the functional extension of the plane drawing and the parametric drawing design in this paper. For the secondary development of AutoCAD functions, the system drawing work will be simplified and work efficiency also has been greatly improved. This introduction of parametric design of AutoCAD drawing system to promote the industrial mass production and related industries economic growth rate similar to the standard I-beam hot-rolled products.

Main purpose of AutoCAD is to create or design 2D and 3D design. it is computer aided design software. AutoCAD is a design tool which will reduce the human efforts compared manual drafting. AutoCAD will eliminate the human error and can be used to draft complex geometry in less time.

Purpose of AutoCAD: -

1. AutoCAD is used to create the computer aided designs or software applications including drafting.
2. AutoCAD develops the application in both the 2D and 3D formats and provide the information to the application.
3. AutoCAD provides tools to design the software's used in the industry, architectures and project management.
4. It provides an easy way to design the software with the designs and architect it according to the need
5. AutoCAD software is used to draw and design the documents and the applications with easy customization options.
6. AutoCAD provides a platform to be used by professionals to create the designs and 3D models.
7. It allows the creation of the professional technical drawings and conceptual designs used for representation of the logics.
8. It allows the drafter to provide the finishing touches and designing with the detailing and linking to the online data.
9. It provides suppliers or operational professionals to review the drawings and modify it according to the requirements.

Objectives of AutoCAD: -

- Learn sketching and taking field dimensions.
- Take data and transform it into graphic drawings.
- Learn basic engineering drawing formats.
- Learn basic AutoCAD skills.
- Learn who draw 2D drawings in AutoCAD.

LED Fixtures: -

In the recent years, LED light fixtures have been widely adopted because they consume less power and have a longer operational life. While the initial adoption of LED fittings was a challenge, the reduction in cost, almost as low as T5 and fluorescent light fixtures, has led to an increase in preference for LED lighting fixtures in commercial lighting design.

Lux Level Requirement: -

•The main objective when using a commercial building is to accomplish a task or conduct an activity, which is why illuminance or the focus and amount of light is important. While under lighting impedes several types of activities, over lighting also poses a problem in accomplishing tasks. To understand lux or illumination level requirements for commercial spaces, it is important to understand the units of measurement of light and the efficacy of their relationship.

•Lux or illuminance – Illuminance or lux is the unit of measurement of the intensity of the level of light, measured in foot candles. Typically, a brightly lit office would require around 400 lux of illumination.

•Lumen or 'luminous flux' – Lumen is the measurement of the total 'amount' of light. One lumen is the measurement of the output of light. Typically, a 100W incandescent bulb used for an office space with ceiling panels for lighting would produce an output of 1600 lumens.

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•The relationship between lux and lumen – Lux measurement helps determine the lumen (output) required given the area that is illuminated. One lux is equal to one lumen spread across one square meter. To achieve higher lumen when lighting a large area based on the lux level requirements, the number of light fixtures is usually increased.

IV. Results: -

Increase productivity with lighting design: -

This point goes primarily for working environments, but home offices can benefit too. Poor lighting will reduce the productivity of employees while good lighting will increase their productivity. This boils down to the biological and physical effects of lighting that we mentioned earlier – when someone's mood is high, their productivity increases, and lighting plays an important role in this.

Improved flexibility with lighting design: -

Flexibility is a major benefit of lighting design. With the ever-growing advancements in technology and lighting control, setting the perfect mood for your space is easier than ever.

By working alongside a professional lighting design consultant with experience in smart lighting and controls, you're given the capability of dimming lights, choosing between pre-set lighting scenes and much more. Lighting controls have become increasingly popular in the hospitality industry due to affect that can be made on customer experience. For example, being able to control the intensity and mood of lighting throughout the day is perfect for restaurants. A brighter atmosphere can be set in the morning to help wake customers, while an intimate and relaxing mood can be set during the evening.

Illusion of space with lighting design: -

Without sufficient lighting, the space of a room will feel small and cramped. By effectively distributing light within an area, a brighter and more impressive space will be shaped. This is mostly due to the elimination of shadows and dark/harsh lighting.

A more spacious room is achieved by professional lighting designers who use a technique called 'layered lighting'. This involves the use of multiple light sources to create the desired effect and atmosphere. Ambient, task and accent lighting make up this 'layered lighting' technique and all serve different purposes. We explain the elements of layered lighting in further detail in one of our recent blogs: The importance of lighting in interior design. Increase productivity with lighting design This point goes primarily for working environments, but home offices can benefit too.

Poor lighting will reduce the productivity of employees while good lighting will increase the productivity. This boils down to the biological and physical effects of lighting that we mentioned earlier – when someone's mood is high, their productivity increases, and lighting plays an important role in this.

To provide illumination so people can see and safely navigate the room. However, lighting goes well beyond this most basic requirement.

With lighting, you can create an atmosphere and mood. You can shift the audience's focus on the stage to wherever you direct them. You can hide certain things and reveal them at your choosing. You can mystify the audience with a sense of awe as you create beautiful landscapes with light that glides through the air and across the stage.

With lighting, you can control the feel of a service.

Advantages:

- Allows the persons to see easily and accurately to work at an efficient speed.
- Prevents fatigue and strain on eyes.
- Helps to create a pleasant atmosphere.
- Provides a perfect lux value that is not less, not more for the respective purpose.
- Provides good lighting maintenance.
- Avoids excessive brightness, contrast, glare and hard shadows.
- Provides the light of correct colour.
- Provides safety, security, and increases productivity.

Features of Good Lighting Scheme:

The features and properties of a good Lighting scheme are as follows –

- It should provide adequate illumination.
- The illumination scheme adopted should avoid hard shadows and glare on the eyes.
- It should have suitable shades and reflectors.
- It should provide light of suitable color
- A good illumination scheme requires the installation of the light source at such a place so as to give uniform light over the working plane.

Conclusion:

With the ability to affect the mood, shape, and size of a room, lighting design is the most important element to consider when designing a space. The design team is paid fees in exchange for its expertise in designing and specifying lighting systems. The design team's definition of value is driven by quality and innovation. The specifications then reach the contractors on the construction side.

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