Standard Lighting Designing Replacing Conventional Lights with LED Lights in DIALux Software for College

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***Abstract*— Lighting evolved its own distinct identity since its inception and it is the most important part for human evolution. One can't imagine life without lights. A light paves a huge dividend role and provides illumination for commercial and residential purposes. These lights can be classified as conventional and LED lighting systems. In our study we have chosen VICT campus in which we will be replacing the conventional lights with LED lights which are more efficient and energy saving solution available in market. We will design the whole system in German based software called DIALux. Initially we will study the present system and design it on software. Apart from this we will also carry LUX assessment and other measuring procedures of the present system then we will design the whole system with the help of DIALux software replacing conventional lights with LED lights. Then we will also find out the payback period for the replacement.** [1][2]

Keywords—Lighting ; Conventional ; LED ; Designing ; DAILux

I. INTRODUCTION

The natural agent that stimulates sight and makes things visible. The word usually refers to a visible light which is visible to the human eye and is responsible for the sense of sight. The speed of light in a vacuum is defined as approx 186,282 miles/sec. Sources of light are sunlight, bulb, lamps, etc. In about 31 December, 1879 Thomas Alva Edison made the first public demonstration of his incandescent light bulb. His light bulb was the first that proved practical and affordable for human illumination.

Conventional lighting systems are those using mounting heights of 50 feet or less. This description is used to differentiate between conventional mounting heights and high mast lighting, which uses mounting heights of 100 feet or more. This section compares the advantages and disadvantages of conventional and high mast lighting and provides guidelines for deciding when to use high mast lighting.

Light Emitting Diodes (LEDs) are part of a class of lighting called Solid State Lighting (SSL). Unlike incandescent or compact fluorescent lamps (CFLs), LEDs are small electronic components that convert electricity into light. Organic light-emitting diodes (OLEDs) and light-emitting polymers (LEPs) are also forms of SSL (ENERGY STAR). LED applications allow for extraordinary flexibility in lighting design with regard to color, brightness, size, shape, and distribution. [3]

II. TERMS RELATED TO ILLUMINATION

1. Illumination:-

Illumination is the light available on the surface. The illumination of the surface is governed by amount of light falling on it. It is measured in lumens per square meter or lux.

2. Light:-

The term light is defined as radiant energy range that will give radial sensation, or it is radiant energy which will give sensation of vision on human eyes. It is denoted by (Q) and unit is lumen-hour.

3. Luminous Flux:-

The total light radiated per second from luminous source per second is known as luminous flux. It is dented by (F) and unit is lumen.

4. Luminous Intensity:-

A point light source which gives luminous flux per unit solid angle in one direction is known as luminous intensity of that light source.

5. Brightness:-

The brightness of the surface is defined as the luminous intensity per unit projected area of the surface in a given direction. It is denoted by (L) and is measured in candela/$m^{2.}$

6. Lumen:-

It is defines as the amount of luminous flux given out in a space represented by one unit of solid angle by a source having intensity of one candle power in all directions.

7. Candle Power:-

It is a light radiating capacity of a source in a given direction and is defined as the number of lumens given out by a source in a unit solid angle in a given direction. It is denoted (c.p.).

8. LUX:-

It is the unit of illumination and is defined as the luminous flux falling per square meter on the surface which is everywhere perpendicular to the rays of light from a source of one candle power and one meter away from it.

9. Foot Candle:-

It is the unit of illumination in FPS system and is defined as the luminous lux falling on the surface of a sphere of one foot radius where the light is falling from the centre of sphere from one candle power source.

III. INTRODUCTION OF DAILUX SOFTWARE

DIALux is a free light calculation program, developed by the German company DIAL GmbH. It is mainly used by lighting designers, consultants, architects, lighting technicians and Electricians. It can be used to calculate the indoor and outdoor lighting. Outdoor enable it to calculate the

light for outdoor jobs, sports fields, roads, paths, squares, etc., and meet DIN EN 12464-2-2007, lights at outdoor workplaces DIN EN 12193 and Light and with lighting Sports lighting and the Danish standards. The program has been regularly updated with new features like:

- Import / export of AutoCAD drawings
- Latest Version (Aug. 2015) is 'DIALux 5.1 evo.'
- The program is available in Danish, Swedish, English and many other languages, and can be freely downloaded from the 8company website. [4]

IV. INDIAN STANDARDS AS PER BEE

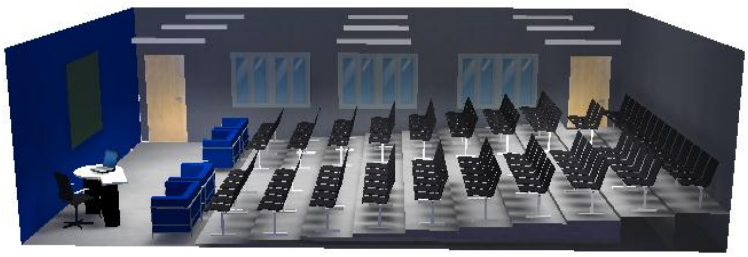
BEE: - Bureau of Energy Efficiency

Bureau of Energy Efficiency is an Organization which specifies Standards of Different Sections which was set up at 1st March 2002.

EDUCATION		
No.	Types of Interior	Required Lux (Min-Avg-Max)
1	Assembly Hall	200-300-500
2	Teaching Space	200-300-500
3	Lecture Theaters	300-500-750
4	Seminar Rooms	300-500-750
5	Art Rooms	300-500-750
6	Needlework Rooms	300-500-750
7	Laboratories	300-500-750
8	Library	200-300-500
9	Music Rooms	200-300-500
10	Sports Halls	200-300-500
11	Workshop	200-300-500
12	Canteen	150-200-300
13	Computer Centre	300-500-750
14	Staffroom	200-300-500

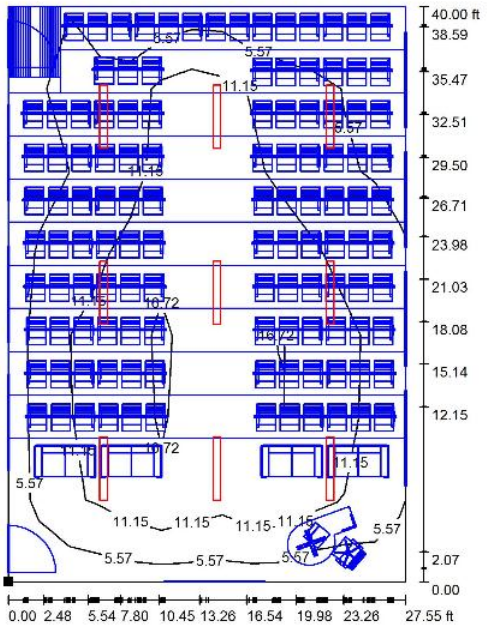
(Table. 1 Indian Standards) [5]

V. SEMINAR HALL DESIGN AND RESULT OBTAINED



(Fig.1 Design in DIALux Software)

The Software was used to design lighting for conventional lights. Here we have given example of seminar hall. The conventional lights are placed at different location in the seminar hall and the values are obtained of the particular section. It is necessary to maintain LUX throughout this section as per standards. We placed conventional lights (Philips) at different points to get required illuminations.



(Fig. 2 Isolines)

70.82	172.22	86.64	172.22	**4.09**
80.19	193.72	100.96	193.72	72.44
100.96	247.57	118.40	247.57	6.02
99.02	247.57	118.40	247.57	118.40
82.55	193.72	104.08	193.72	103.97
85.57	193.72	107.63	204.54	106.56
101.71	**258.33**	129.56	**258.33**	6.13

(Table. 2 LUX Table)

The above table is LUX table obtained in software. As per Indian standard the minimum value should be 300 lux and the maximum value should be 750 lux. But as observed in the table, the required LUX is not obtained. So we are going to place LED lights in different points to get required LUX.

RESULT		
E_{min}	E_{avg}	E_{max}
4.09	107.63	258.33

(Table. 3 Result Table)

VI. ADVANTAGES AND DISADVANTAGES

Disadvantages of Conventional Lights

- Waste of lot of energy as heat
- Smaller life
- High billing cost
- Less energy efficient
- Pollutants released into the atmosphere

Advantages of LED Lights over Conventional Lights

- Longer Life
- More Energy Efficient
- Ecologically Friendly
- Durable Quality
- Zero Ultra Violet rays Emissions
- Design Flexibility
- Can Operate in Extremely Cold or Hot Temperature
- Low Voltage

LUX	INCANDESCENT	CFL	LED	SAVINGS
500	40 watts	9 watts	7 watts	Rs 990-2650
850	60 watts	13 watts	11 watts	Rs 1650-4300
1600	100 watts	23 watts	20 watts	Rs 2650-6650

(Table. 4 Savings Table)

From above table it is observed that for same LUX the power ratings for different lightings are different. For example, if we use 500 LUX than for Incandescent lights it consumes 40 watts, for CFL lights it consumes 9 watts and for LED Lights it only consumes 7 watts. The savings per annum is around Rs 990-2640. So from this we can conclude that LED Lights consumes less power as compared to Conventional lights and it has Longer Life.

VII. CONCLUSION

Initially, we had analyzed the present (Conventional) system. We had also observed that in some sections sufficient lighting is not getting. This we came to know by measuring the LUX assessment in different sections.Then we had designed all sections of which we had done LUX assessment in DIALux software. In this software, we had found the required output of some parameters such as Gray Scale, Lux Table and Isolines. We observed form this that how much required lux is getting at particular working sections. At this stage we came to conclusion that proper lighting according to the standard LUX is need to be installed which would be our future work. Apart from that we would be designing for same system in LED light.

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