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RESEARCH ARTICLE

A CASE STUDY ON ENERGY EFFICIENT LIGHTING SCHEME AND ANALYSIS OF INSUFFICIENT LIGHTING OF COLLAGE BUILDINGS USING DIALUX SOFTWARE

***Kartik, K. Patel, Mitresh, A. Modi and Jayesh, B. Patel**

Department of Electrical Engineering, VPMP Polytechnic, Gandhinagar Gujarat, India

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ABSTRACT

In 2012, the International Energy Agency are publish that electricity consumption for lighting is about 20% of the total global electricity consumption, being about 49% of the total electricity consumption for lighting of the sector service. Around two thirds of the lighting systems nowadays are based on technologies developed before 1970, and they have lower performance that the current technology. A complete change of the lighting system and the implementation of control and regulation systems can provide relevant energy savings. In many of places or buildings are use only artificial lighting scheme. The daylight are reduces the cost of energy consumption with lighting load. In case of cloudy condition there is less availability of daylight. Thus for proper visualization of objects, manage lighting scheme with artificial as well as daylight harvesting. This paper describes the flooding lighting in the collage building when conventional light is use. This light is placed at different points in collage. Using DIALUX software reduces the unwanted shadow and glare effect in building. Thus paper aim is design building with proper and efficient lighting scheme with control action of sensor on combination of artificial and daylight with saving of electrical energy cost.

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INTRODUCTION

The Over centuries artificial lighting have made a significant progress from candles, gas to Kerosene Lamps to today's incandescent, fluorescent Lightings. As a result the overall operating cost of light has been reduced to 4.5 orders of magnitude since the 1900s. The world uses 0.82% of GDP in the Light, World GDP of 65.14 T$ (USD). Which means 495 B$ in Lighting. Hence Lighting should be such that will reduce the cost for that energy efficient Lighting is the best possible solution to reduce the overall cost. For that energy auditors and engineers are focusing on the use of energy efficient lighting devices which will help in the reduction in the overall cost of Lighting. Recent trends witness companies incurring a one-time cost to install LED lights in place of halogen bulbs, implement real time energy monitoring and measurement software tools, etc. Physiological changes that occur as a person ages include reduced pupil size, cloudier lenses, and reduction in the amount of photoreceptors that play a dominant role in low level lighting, all have a significant impact on visual performance as light levels decrease. The artificial and daylight harvesting methods with energy efficient luminaries is dominant in today life.

****Corresponding author: Kartik, K. Patel,***
Department of Electrical Engineering, VPMP Polytechnic, Gandhinagar Gujarat, India.

Not only efficient lighting but also proper lighting control gives properly authorized building. As daylight produce less heat per unit illumination than many artificial lighting systems thus day lighting may reduce the cooling requirement when it replace artificial lighting. The daylight is reduces the cost of energy consumption with lighting load. In case of cloudy condition there is less availability of daylight. Thus for proper visualization of objects, manage lighting scheme with artificial and daylight harvesting. The tool like DAILUX software reduces the unwanted shadow and glare effect in building.

CASE STUDY

The college building chosen for case study is situated in VPMP POLYTECHNIC near Sector-15 in Gandhinagar district at Gujarat. This college building has 3 floors with classrooms, Laboratories, office and library. The building is RCC framed structured. As per existing design there uses luminaries. And only uses artificial lighting during college hours from (8.00AM -6.00 PM) So as an electrical engineer we planned to use daylight harvesting scheme for illuminating total college building. Also author felt that the unwanted glare and shadow could remove with DIALUX software. Thus the solution is made by the authors could help in convincing the college authority for changing the existing plan for illumination and go towards the reducing cost of lighting load as fulfillment made by author.

Conventional Mvethod

- Artificial illumination
- Existing illumination action

Luminance Ratio in World

The program has been regularly updated with new features like:

➢Import / export of AutoCAD drawings
➢3D visualization with POW ray
➢Road Guide with Danish standards.
➢Latest Version (Aug. 2015) is 'DIALux 5.1 evo.'

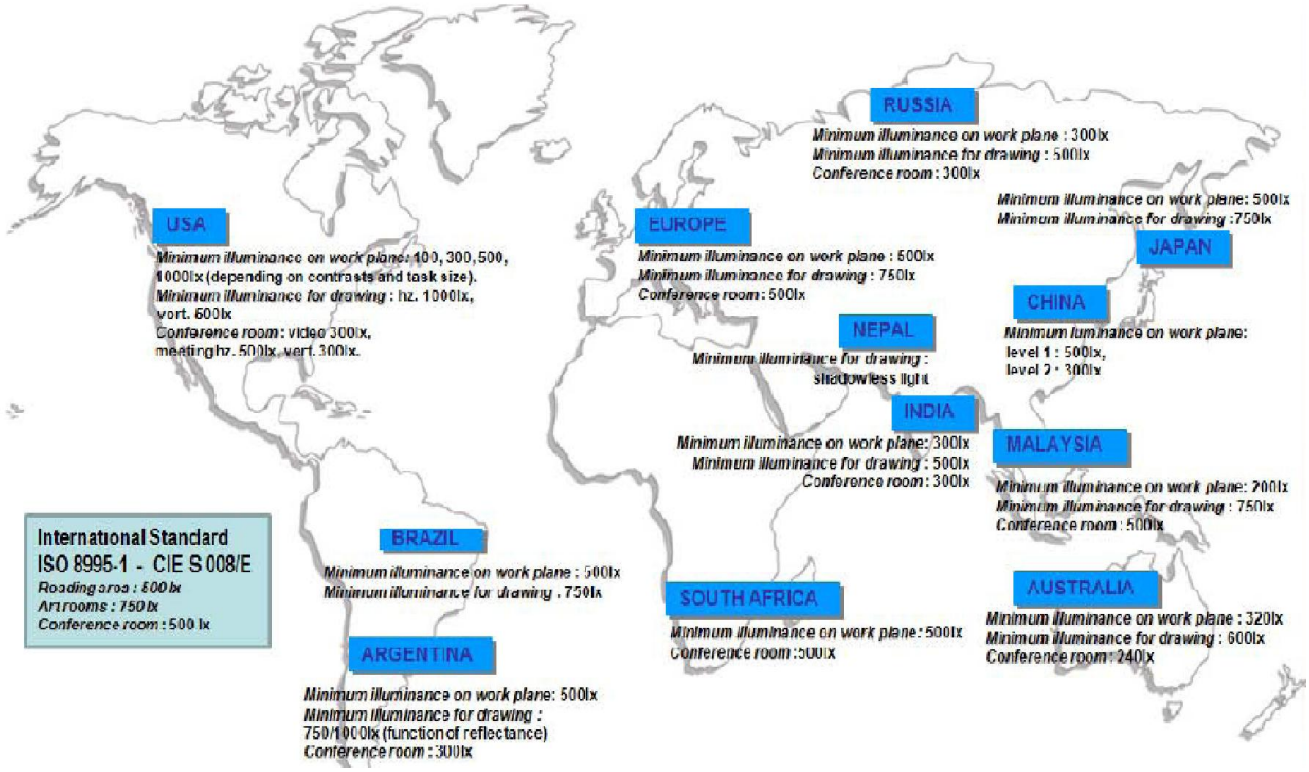

Figure 1. (Luminance Ratio in world)

Required Light Levels In India

EDUCATION		
No.	Types of Interior	Required Lux (Min – Avg – Max)
1	Assembly Hall	200-300-500
2	Teaching Space	200-300-500
3	Lecture Theatres	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	Libraries	200-300-500
9	Music Rooms	200-300-500
10	Sports Halls	200-300-500
11	Workshops	200-300-500
12	Canteen	150-200-300
13	Computer Center	300-500-750
14	Staffrooms	200-300-500

Table: 1.1 (Light Levels in India)

DIALux Software

DIALux is continuously being developed by a team of 20. You can plan in DIALux with the luminaries of the world's leading manufacturers and therefore have the greatest possible freedom in the design process. And the list of international partner companies is getting longer and longer.

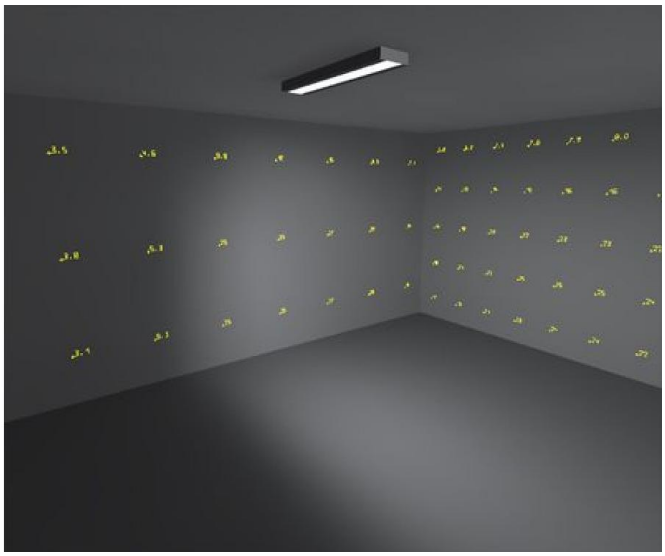

Figure 2. (Example of DIALux Evo 5.1)

Make design of Collage building and output in DIALUX.

This software interface is use to design the lighting in the Collage building. The conventional lights are laced at the different location in classrooms, labs, offices etc. in this case

study we are displayed to place the lights on the location in classrooms, offices etc. the case study in order to obtain the output and would help us getting the no of lights required in classrooms, offices, labs etc.

Calculation of Collage building by Dialux

- For Conventional Lighting System:

Classroom

LUX Assessment: Ground Floor

Table 4.1. (Lux Measurement of Classroom - G1with Conventional Light)

Lux-Measurement Class: G4 Without light Season : Winter Unit : Lux Meter: Kmlux99				
10	70	150	120	10
50	40	80	80	9
40	30	40	40	8
20	20	30	30	7
20	20	20	20	6
10	10	10	11	5
10	10	10	10	4
10	10	10	10	3
10	10	10	17	2
10	10	10	15	1
D	C	B	A	B.N.

Auto Cadd Design of Classes of Collage Building

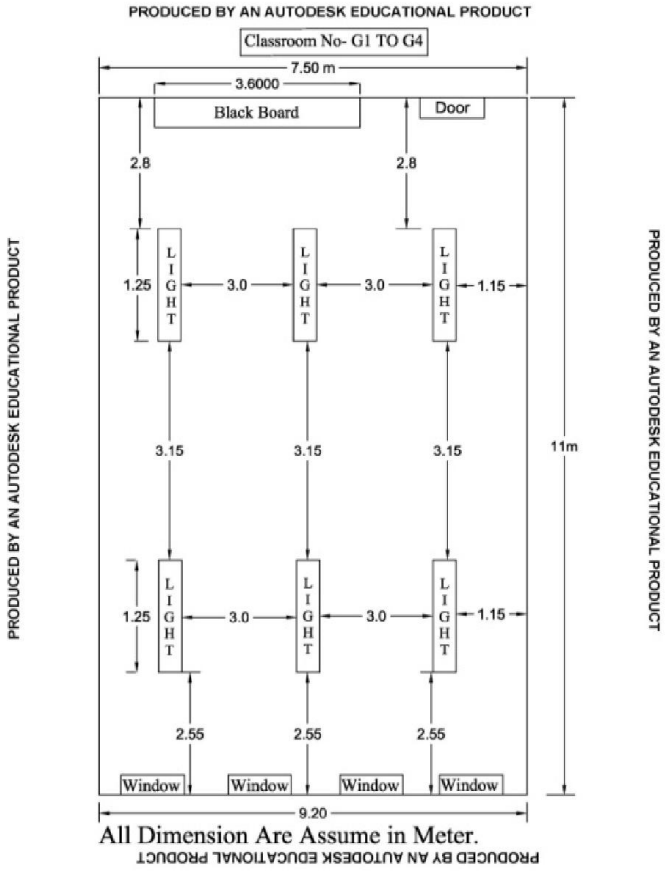

Figure 3. (Example of Classroom in Autocadd)

Table 4.8 (Lux Measurement of Classroom – G4 with - out Conventional Light)

Lux-measurement Class: G1 With light Season: Winter Unit: lux Meter: kmlux99				
10	130	110	110	180
9	120	120	120	150
8	130	130	130	150
7	120	120	120	120
6	80	90	90	90
5	70	80	80	80
4	90	100	100	110
3	110	120	120	110
2	80	100	90	80
1	50	60	50	50
B.N	A	B	C	D

DiaLUX Design of Classes of Collage Building

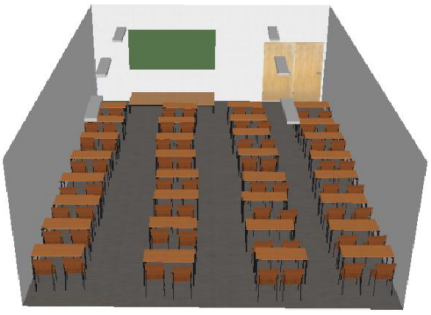

Figure 4. (Example of Classroom in Dialux-Front)

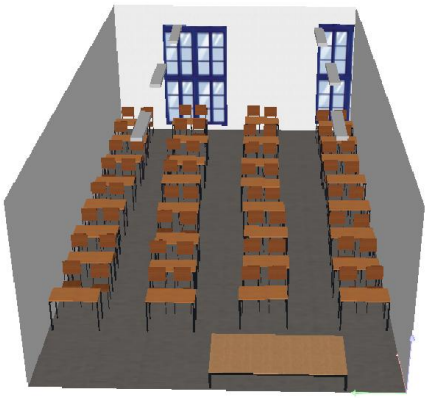

Figure 5. (Example of Classroom in Dialux-Side)

Figure 5. (Example of Classroom in Dialux-Top)

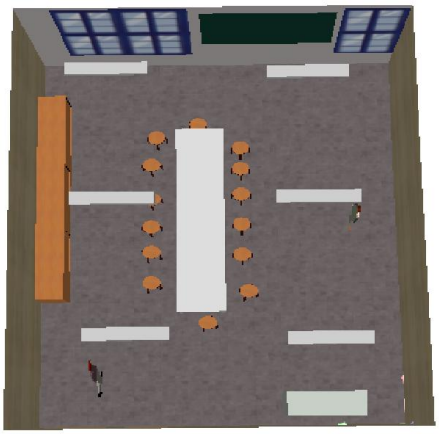

Figure 6. (Example of LAB in Dialux-Top)

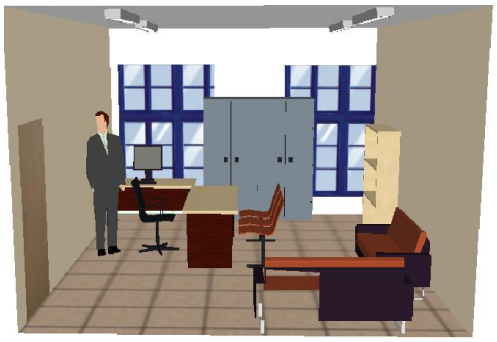

Figure 7. (Example of office in Dialux-Top)

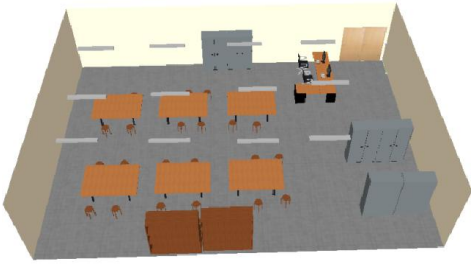

Figure 8. (Example of Library in Dialux-Top)

DiaLux Output Plane

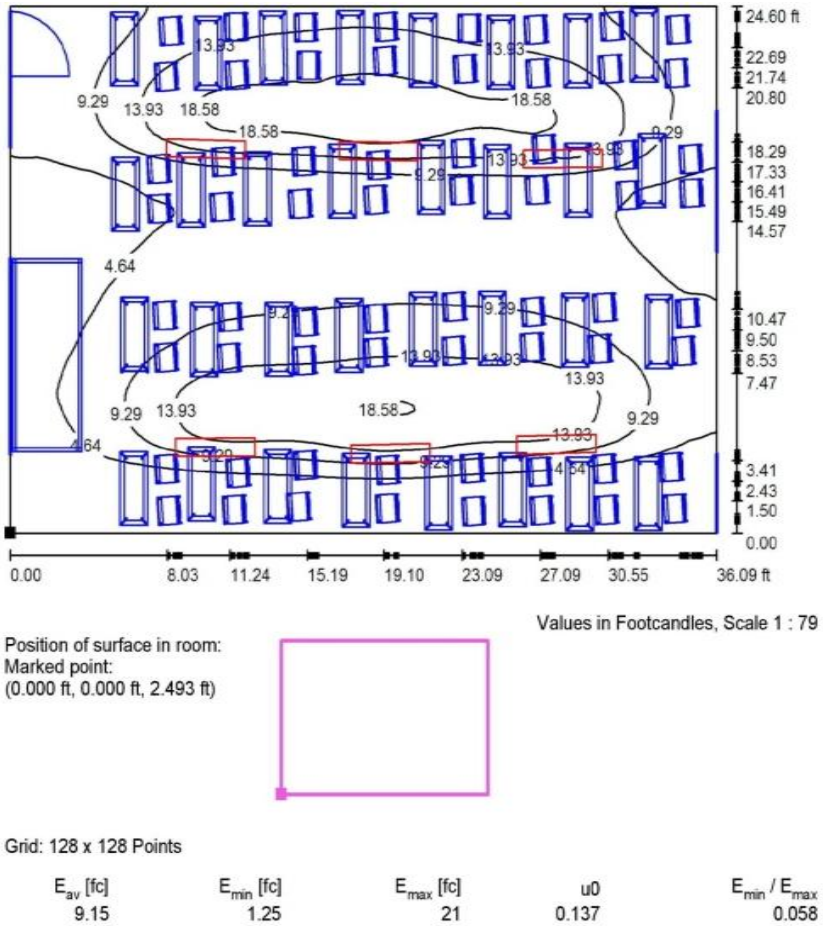

Figure 8. (Example of Classroom (Isoline) in Dialux plane)

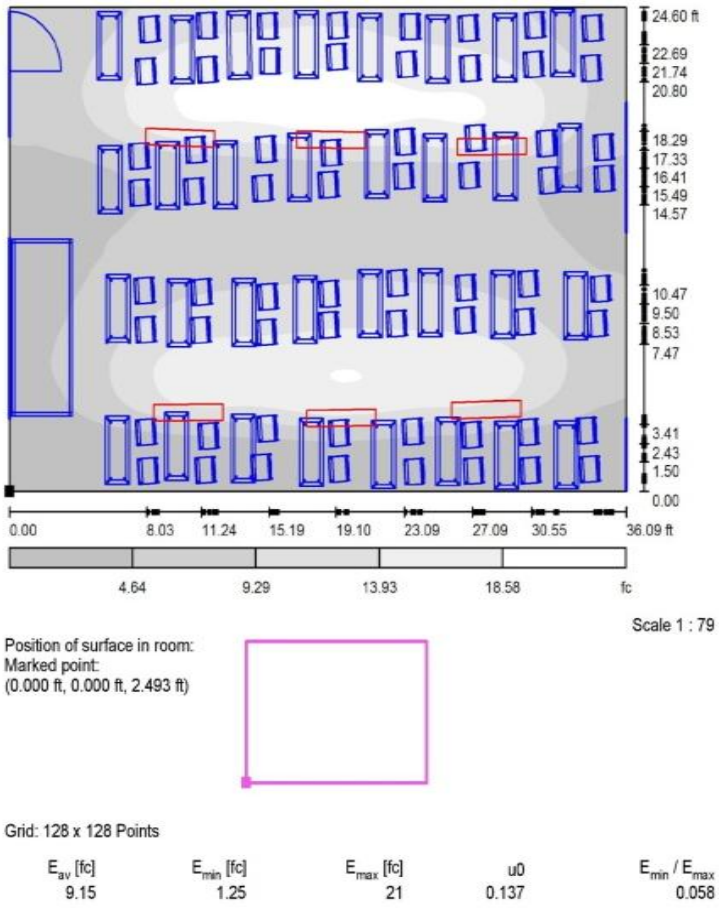

Figure 9. (Example of Classroom (Grayscale) in Dialux)

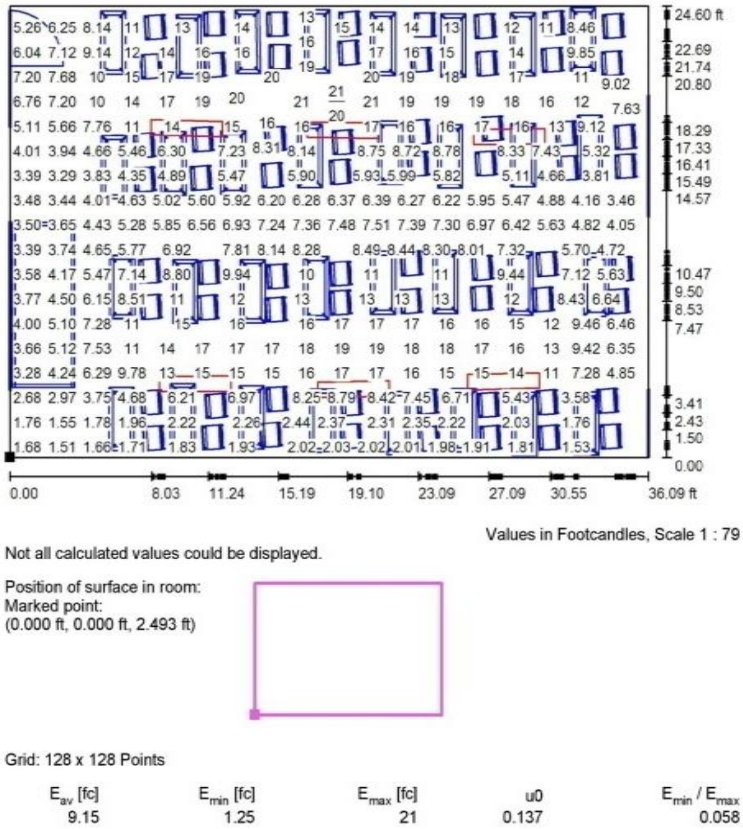

Figure 10. (Example of Classroom (Value Chart) in Dialux)

As seen above in Figures we are created autocadd files, Dialux files and output such as value chart File, Grayscale Files and Isoline Files for Collage building. Here the lighting is place at different points at the gantry in order to get the proper illumination in the collage classrooms and offices. Here conventional lights like as MH, Mercury lights and florescent tube lights are place and the false color is obtained.

Disadvantages of Normal Lighting System

- Waste of lot of energy as heat.
- Small Life.
- High Billing cost.
- Less energy efficient.
- Pollutants released into the atmosphere.

Advantages of Energy Efficient lighting System

- Longer Life
- Energy Efficiency
- Ecologically Friendly
- Durable Quality
- Zero UV Emissions
- Design Flexibility
- Operational in Extremely Cold or Hot Temperatures
- Low-Voltage

Conclusion

Energy efficient lighting simulation proves beneficial for given building. Using DIALUX software tool removal of unwanted shadow and glare effect of walls and chairs takes place. The direct effect of efficient lighting on reducing of total cost. This paper aim is to focus on lighting simulation tools for advanced efficient lighting methods. The day lighting will provide cost reduction if properly controlled. The conventional Lights are used in the switchyard. The Analysis was carried out in the section and a grid was placed then the whole section was analyzed and conventional lights were placed in those sections as been placed in the present system in the case study but were found that the lighting placed were insufficient and proper illumination was obtained by placing the LED lights in those section.

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