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# An Efficient Scheme of Lighting For Power Plant By Using Dialux

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**ABSTRACT**: Lighting or illumination in the past is considered as a routine job with average considerations. As technology advances, this genre of engineering has raised expectations of common as well as industrial clique. Beyond a mere source of light and aesthetics views, illumination is being treated as one of the most important issues. Industrial lighting systems are installed for the purpose of providing energy efficient illumination in quality and quantity sufficient for safety and also to increase visibility and productivity within a pleasant environment.
There are no absolute guidelines which may be applied to the selection of a particular lighting strategy for most industrial buildings. It is frequently necessary to employ several different lighting methods to effectively meet the design objectives. To solve a lighting design problem, one can try a variety of solutions in a trial-and-error basis approach to problem solving, but this is not an organized procedure. For any design problem, a rational, efficient and professional approach to problem solving provides consistently good lighting design.

**KEYWORDS:** Industrial lighting, luminary, Illuminance, uniformity, Dialux.

## I.INTRODUCTION

It is time to focus on illumination system. By using this system we can produce artificial radiation level close to natural radiation level. For this there is a need of artificial sources. These artificial sources follow laws of Illumination. Illumination system consists of lamp which may be of any kind like Incandescent lamp, Discharge lamp or Fluorescent lamp along with control mechanism placed in appropriate luminaire.

Generally we have to maintain the luminance ratio from brightest to darkest i.e. 10:3:1. Elimination of glare results in proper visibility, easiness in viewing, and creates pleasing environment. Main focus is given on good uniform distribution of light in overall the room surfaces. Commonly white ceiling with semi indirect luminaires are preferred. We can also employ false ceiling (white or off white) with another type of luminaries. Most of the issues related to lighting design are higher bright luminaires, more dark floors and various furniture. Mostly applied scheme is to use light color interiors with large sources having lower brightness. Natural illumination depends on weather, season or time of the day. It also depends on openings or windows. It is the general noting that at 20 – 25' from window, daylight falls below 10 lux. For such conditions artificial lighting needs to be turned on. Normal technique is to partially open or close them according to whether or time of day condition, thus makes uniform lighting. Upper section of window must be nearer to ceiling. It controls the flow of light up to the end of the room. The height of top window is greater than ½ the depth of the room. Window area is responsible for glare. Hence Glare area = 1/5th the space of floor.
Location of lamps are based on the parameters such as candle power, maximum allowable spacing, height at which located. A higher mounting height creates dark shadows as well as dark spaces. Preferable condition for lamps is closer to ceiling & obstructions should be cleared for proper illumination. They may be mounted on surface, suspended or recessed in the ceiling.

Industrial lighting is dictated by nature of work, shape of space and ceiling structures. Industrial lighting is classified as single storey without skylight, multi storey, and single storey with skylight or high bay light. Additional lighting is used only when the general lighting does not meet illumination requirements. Fluorescent lamps with louvres & diffusers are preferred for office lighting. Educational institutes need vertical illumination for having sufficient light on blackboards.

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In all commercial places, lighting scheme is applied to illuminate a particular place / product. In hospitals lighting is done as per the convenience of doctors, patients & other staff members. Operation theatres require the lighting which shadow free whereas X-ray rooms require less luminance levels.

## II.NEED FO STUDY

The advancements in technology have set up a path to the modern industries to develop innovative technologies within the limits of their industries to complete their industrial goals.

Research and development work in these areas has developed and introduced large varieties of luminaires and provide best options for one's special needs. An extensive range of light sources and luminaires are available. With the progress in technical field, the scope of lighting technology has increased, and this has in turn led to the development of sophisticated lighting tools, equipment, etc.
Offices, workstations, shop floors, roads, unloading stations, power houses, gar-dens, residential areas, everywhere lighting is now viewed with a serious technical point of view. This fact that makes difficult for the lighting designer to be adequately informed regarding the proper range of lamps and luminaires available and to decide on which is more precise solution to achieve lighting requirements for a certain project.

The industrial illumination design demands execution and application of the related norms and standards. The illumination requirements vary as per the areas depending on the activities that are carried out in that particular area. For e.g. for engineering office which deals with technical drawings needs a relatively high illumination level, of about 750 lux, whereas the case is different in storage rooms or godowns, which will be occasionally accessed, needs only 100 to 150 lux. At some places the task areas are important while somewhere else the surrounding area might be critical.

## III.GENERAL REQUIREMENT FOR INDOOR ILLUMINATION

Industrial facilities encompass a wide variety of working conditions and seeing tasks. These can range from "clean rooms" where the environment (temperature, humidity and dirt contamination) is highly controlled, and very difficult seeing tasks requiring a high illuminance are performed, to foundries where environmental conditions are largely uncontrollable and visual tasks are generally rather easy and require relatively low levels of illuminations. A sufficient lighting is the basic reason of why we are able to see our surroundings, unless they themselves are light sources, since objects appear bright only when illuminated. It is the task of illumination to give objects the required brightness.

## IV. GENERAL REQUIREMENT FOR OUTDOOR ILLUMINATION

For work or recreation, outdoor illumination enables people to see essential details in order to undertake their activities at night; it facilitates and enhances the safety and security of persons or property. It is used for advertising or display. Most lighting is used for general illumination, to provide simple visibility in areas used by pedestrians (walkways), pedestrians and vehicles (parking lots) or vehicles alone (roadways) at night. The lighting is used to allow the relatively simple tasks of navigation are a different range of brightness required for different tasks to be performed.

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## V. RESULT AND DISCUSSION

| Parameters | Manual Calculation | DIALux |
|---|---|---|
| **Illuminance $E_{av}$** | 100 lux | 106 lux |
| **Illuminance $E_{min}$** | N.A. | 53 |
| **Illuminance $E_{max}$** | N.A. | 129 |
| **Uniformity ratio** | N.A. | 0.502 |
| **3D Rendering** | N.A. | Possible |
| **Lighting Layout** | Has to be planned by designer | Automatically generated by software as well as planned by designer |
| **Object Reflectances** | N.A. | Considered |
| **Calculation Surface** | Fixed | Can be placed at different levels |
| **Isolines** | N.A. | Automatically generated by software |

| Parameters | Manual Calculation | DIALux |
|---|---|---|
| **Illuminance $E_{av}$** | 200 lux | 208 lux |
| **Illuminance $E_{min}$** | N.A. | 106 |
| **Illuminance $E_{max}$** | N.A. | 285 |
| **Uniformity ratio** | N.A. | 0.511 |
| **3D Rendering** | N.A. | Possible |
| **Lighting Layout** | Has to be planned by designer | Automatically generated by software as well as planned by designer |
| **Object Reflectances** | N.A. | Considered |
| **Calculation Surface** | Fixed | Can be placed at different levels |
| **Isolines** | N.A. | Automatically generated by software |

**Table 4.2: Comparison of Results for Battery Room Table 4.2: Comparison of Results for Turbine house**

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| Parameters | Manual Calculation | DIALux |
|---|---|---|
| **Illuminance $E_{av}$** | 200 lux | 203 lux |
| **Illuminance $E_{min}$** | N.A. | 118 |
| **Illuminance $E_{max}$** | N.A. | 278 |
| **Uniformity ratio** | N.A. | 0.579 |
| **3D Rendering** | N.A. | Possible |
| **Lighting Layout** | Has to be planned by designer | Automatically generated by software as well as planned by designer |
| **Object Reflectances** | N.A. | Considered |
| **Calculation Surface** | Fixed | Can be placed at different levels |
| **Isolines** | N.A. | Automatically generated by software |

**Table 4.2: Comparison of Results for Pump House**

| Parameters | Manual Calculation | DIALux |
|---|---|---|
| **Illuminance $E_{av}$** | 300 lux | 306 lux |
| **Illuminance $E_{min}$** | N.A. | 200 |
| **Illuminance $E_{max}$** | N.A. | 369 |
| **Uniformity ratio** | N.A. | 0.655 |
| **3D Rendering** | N.A. | Possible |
| **Lighting Layout** | Has to be planned by designer | Automatically generated by software as well as planned by designer |
| **Object Reflectances** | N.A. | Considered |
| **Calculation Surface** | Fixed | Can be placed at different levels |
| **Isolines** | N.A. | Automatically generated by software |

**Table 4.2: Comparison of Results for Control room**

## VI.CONCLUSION

The comparison of the mathematical analysis and the software analysis clearly show that the outputs of the software are valid and very precise. The software provides most accurate calculations which consider the reflectances of the room surfaces and objects, which when attempted in manual calculations, become unmanageable. Thus, the software results can be accepted widely. Secondly, but most importantly, the software is in accordance with the relevant standards followed worldwide for illumination design.

There is huge requirement for lighting solution in our existing system. Prominent aspects of lighting can extend their work as far as possible. The aspects such as wastage of energy natural or weather disturbances can have major impact on public health, safety. These aspects can be decreased by proper designing & implementing lighting scheme. If the luminaries are not well shielded then there will be variation in glare & contras value. In a situation like this a compromise has to make over lighting. For striking a balance between all the aspects of illumination and the hazards involved, the software can be further used and explored for design solutions.

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