RGPVNOTES.IN

Program : **B.E**

Subject Name: **Traffic Engineering**

Subject Code: **CE-8003**

Semester: **8th**

Unit -IV.

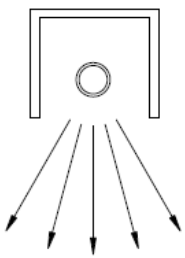
Street Lighting: (i) Methods of light distribution. (ii) Design of street lighting system. (iii) Definitions- Luminaire, foot candle, Lumen, utilization and maintenance factors. (iv) Different types of light sources used for street lighting. (v) Fundamental factors of night vision.

Methods of light distribution

There are also sub methods of lighting methods given below.

Direct Lighting

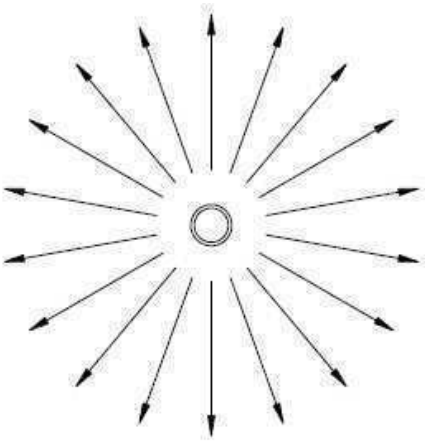
Luminous flux of fixture's directed towards to a plane at direct lighting. Due to the fact that directing of light, reflection factors have less effect. Because of this, it can be said that system has high efficiency in use but there are some problem occurs in the system like shadows and homogenous lighting level at whole volume. To solve these problems, lamps should be placed as a homogenous and lamps should be preferred correctly. Direct lighting lamps mount with the help of a specific length of hanger wire which helps to increase light distribution. However, this length should be chosen correctly to get better results. There is also a reflector in armatures which helps to increase of light distribution too.



DIRECT LIGHTING
AT LEAST 90% OF
LIGHT GOES DOWNWARD

Diffused Lighting

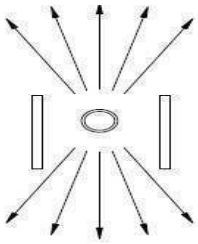
Diffused lighting means half of luminous flux from the source reaches to the plane by reflection and half of flux reaches to plane directly. Surface reflection factors have important role in this lighting more than model of armature. On the other hand, there is a negative effect of diffuse lighting which is "an armature needs maintenance and cleaning to reduce the effect of decrease on efficiency of armature with the time". Due to the light diffused, it produces fewer shadows so this technique usually used in indoor application such as residence.



INDIRECT LIGHTING
LIGHT IS DISTRIBUTED
IN ALL DIRECTIONS

Semi Direct Lighting

Different from direct l than light directed to the surface produced volume. Moreover, it should be stated that some of negative effects of direct lighting decreases with this technique.



DIRECT/INDIRECT LIGHTING
40-60% UPLIGHT
AND 60-40% DOWNLIGHT

SEMI-INDIRECT LIGHTING
60-90% UPLIGHT
AND 40-10% DOWNLIGHT

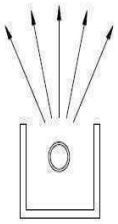
SEMI-DIRECT LIGHTING
10-40% UPLIGHT
AND 90-60% DOWNLIGHT

Semi Indirect Lighting

Unlike half direct lighting, it could be informed that light reflected from surfaces are higher than light directed to the surface produced by a source.

1. **Indirect Lighting**

In this technique, light from total luminous flux of source reflect by surface and reach to plane. There is no direct lighting in this technique.



INDIRECT LIGHTING
AT LEAST 90% OF
LIGHT GOES UPWARD

2. The lamp lumen maintenance factor is particularly important for LED

Factors such as RMF and SMF are affected by the location of the luminaries – whether an industrial warehouse or an office, for example. This would in turn affect the LMF in terms of dust-build up, which has an effect on light levels.

3. Pollution levels for the luminaries and space can be viewed in the same way for LEDs as they would be for fluorescent lighting – dust and dirt will affect the quality of output from both.

However, with LED lighting the LLMF is particularly significant, and so is its impact on the overall maintenance factor. LEDs have a very long service life – in fact, it is highly likely that an office would be refurbished before the LED lighting required replacement.

4. Service life is key to the calculation in terms of energy use and cost

When specifying LEDs it is therefore very important to indicate the service life used in calculations because it will lead to decisions on the initial light level and the number of installed luminaires. This will greatly affect the amount of lighting required – and therefore have an impact on both capital and operational costs.

The power and lifetime of an LED is generally expressed as something like:

L80 B10 50,000 hours at 25C. Here, L is the service life; B is the gradual failure; and h is the hours of service life referred to.

5. The products may outlive the scheme they're installed in

Having an accurate LLMF in order to find the correct maintenance factor for a lighting project has other benefits in terms of planning for client requirements. For example, with such extended LED lifetimes available, clients may want to consider if they need a 50,000-hour life in their lighting system.

Why plan for 12 to 15 years of operation, if the client is only taking on a seven-year lease for an office space? By changing this value, the LLMF will be altered – and the amount of light and number of luminaires could be greatly reduced. This will save the client money in the short- and long-term.

6. Comparing like-with-like is very important for designers and end users

One of the main challenges for those who plan lighting installations is that it is difficult to compare like-for-like when specifying.

For example, we find office luminaries that may be L80 B10 50,000 hours at 25oC all the way down to L70 B50 30,000h at 25oC. What's more, the lack of consistency in comparative figures makes it difficult for clients to make a clear comparison.

Clearly, a lot of information needs to be gathered together in order to formulate an accurate maintenance factor.

7. New standards can help with comparisons

Some very useful sources of information have been developed for use across Europe to help lighting specifies find the right figure quickly. One of these is the ENEC+ organization which is developing standards for the validation of the lifetime and performance of LED-based products. The aim is to give users of the products confidence that what they are specifying and purchasing will perform as stated. The ENEC+ mark will also standardize the use of L and B factors, making direct comparisons much easier.

Another organization that has carried out in-depth research in this field is ZVEI, a European body for the electro technical and lighting industries. It has produced a guide to reliable planning with LED lighting.

8. Just because the MF is above 0.8 doesn't mean it's wrong

Clients are right to be suspicious of high maintenance factor figures. But just because it's higher than 0.8 doesn't make it wrong.

Designers at the early stages of a project, whether new-build or refurbishment, often work without all the information. Some intelligent approximations are to be expected. However, with a standardized method for verifying LLMF and LSF available, and also guidance on how to compare these directly, there is no reason to use 0.8 because it has always been done that way.

Too often, designs that use an accurate maintenance factor of 0.88 can be returned with a request to use 0.8, even though that is an incorrect figure. This encourages the practice and should be stopped.

9. Poor design and over specking waste the benefits of LEDs

As the SLL Code for Lighting points out: 'The MF has a great impact on energy efficiency.' If we specify too much lighting at the start of a project because of inaccurate maintenance factors, then the client will pay for that heavily through their electricity bills.

It has often been said that in the world of energy saving, lighting is the 'low-hanging fruit' – could this be because it has been over-specified too often and for too long?

10. We can all make things better

Manufacturers like Triplex are working to provide clear information on its products by engaging with projects such as ENEC+ and ZVEI. Designers should move away from applying 0.8 universally and treat each project as a one-off. And clients need to look carefully at the costs for lighting and make their requirements clear. Over-specifying is already a problem in other areas of building services such as pumps and fans. There is no need for lighting to take the same route.

Different types of light sources used for street lighting

A street light, light pole, lamppost, street lamp, light standard, or lamp standard is a raised source of light on the edge of a road or path. Modern lamps may also have light-sensitive photocells that activate automatically when light is or is not needed: dusk, dawn, or the onset of dark weather. This function in older lighting systems could have been performed with the aid of a solar dial. Many street light systems are being connected underground instead of wiring from one utility post to another.

Gas lamp lighting

The first widespread system of street lighting used piped coal gas as fuel. Stephen Hales was the first person who procured a flammable fluid from the actual distillation of coal in 1726 and John Clayton, in 1735, called gas the "spirit" of coal and discovered its flammability by accident.

Fayola Fernandina

Fayola Fernandina is a traditional design of Gas Street light which remains popular in Spain. Essentially it is a neo-classical French gas lamp style dating from the late 18th century. It may be either a wall-bracket or standard lamp.

Arc lamps

The first electric street lighting employed arc lamps, initially the 'Electric candle, or 'Yablochkov candle' developed by a Russian, Pavel Yablochkov, in 1875. This was a carbon arc lamp employing alternating current, which ensured that both electrodes were consumed at equal rates. In 1876, the common council of the City of Los Angeles ordered four arc lights installed in various places in the fledgling town for street lighting.

Modern light

- **High-intensity discharge lamps,**
- **High pressure sodium lamps**
- **LED or induction lights**

Fundamental factors of night vision

NIGHT VISION is the ability to see in low light conditions. Whether by biological or technological means, night vision is made possible by a combination of two approaches: sufficient spectral range, and sufficient intensity range. Humans have poor night vision compared to many animals, in part because the human eye lacks.

Luminaries

Luminaries is an electrical device used to create artificial light by use of an electric lamp. All light fixtures have a fixture body and a light socket to hold the lamp and allow for its replacement.

Fixtures may also have a switch to control the light, either attached to the lamp body or attached to the power cable. Permanent light fixtures, such as dining room chandeliers, may use a wall switch to turn them on and off; as such, these fixtures may have no switch on the fixture itself.

Foot-candle

A foot-candle (sometimes foot candle; abbreviated fc, lm/ft^2, or sometimes ft-c) is a non-SI unit of luminance or light intensity. The name "foot-candle" conveys "the luminance cast on a surface by a one-candela source one foot away". This unit is commonly used in lighting layouts in parts of the world where SAE units are used.

The unit foot-candle is defined as the amount of illumination the inside surface of a one-foot-radius sphere would be receiving if there were a uniform point source of one candela in the exact center of the sphere. Alternatively, it can be defined as the luminance on a one-square foot surface of which there is a uniformly distributed flux of one lumen.

LUMEN

The lumen (symbol: lm) is the SI derived unit of luminous flux, a measure of the total quantity of visible light emitted by a source. Luminous flux differs from power (radiant flux) in that radiant flux includes all electromagnetic waves emitted, while luminous flux is weighted according to a model of the human eye's sensitivity to various wavelengths. Lumens are related to lux in that one lux is one lumen per square meter.

The lumen is defined in relation to the candela as

1 lm = 1 cd · sr.

If a light source emits one candela of luminous intensity uniformly across a solid angle of one steradian, the total luminous flux emitted into that angle is one lumen (1 cd·1 sr = 1 lm). Alternatively, an isotropic one-candela light-source emits a total luminous flux of exactly 4π lumens. If the source were partially covered by an ideal absorbing hemisphere, that system would radiate half as much luminous flux—only 2π lumens.

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