1.6 LIGHTING CALCULATIONS

There are several methods have been employed for lighting calculation, some of those methods are as follows.

1. Watts - per square metre method
2. Lumen (or) light flux method
3. Point - to - point method

Watts - per square - metre method:

This method is more adaptive for rough calculation or checking and it is simple "Thumb rule" method of calculation. It consists in making an allowance desired on the assumption of an average figure of overall efficiency of the system.

Lumen (or) light flux method:

This method is applicable to those cases where the sources of light are such as to produce an approximate uniform illumination over the working plane or where an average value is required.

$$Total\ lumens\ received\ on\ working\ plane = Number\ of\ lamps \times Wattage\ of\ each\ lamp \times Efficiency\ of\ each\ lamp\ in\ terms\ of\ \frac{lumens}{watt} \times Coefficient of\ utilisation \times \frac{1}{Depreciation\ factor}$$

$$Maintenance\ factor = \frac{1}{Depreciation\ factor}$$

(i) Total lumens received:

It is defined as the ratio of lumens reaching the working plane to the total lumens given out by the lamp or lamps. It is known as utilisation factor or co-efficient of utilisation. Its value varies from 0.25 to 0.5 and from 0.1 to 0.25 for direct and indirect lighting schemes respectively.

(ii) Maintenance factor:

It is defined as the ratio of ultimate maintained metre-candles on the working plane to the initial metre-candles. Its value is more if the lamp fittings are cleaned regularly, say 0.8, and less of there is much dust etc, say 0.6.

(iii) Depreciation factor:

This is merely the inverse of the maintenance factor and is defined as the ratio of the initial metre candles to the ultimate maintained metre-candles on the working plane. Its value is greater than unity.

Point to point (or) Inverse square law method:

This method is applicable where the illumination at a point due to one or more sources of light is required, the candle power of the sources in the particular direction under consideration being known. This method is not much used (because of its complicated and cumbersome applications); it is employed only in some special problems such as flood lighting, yard lighting etc.,

Calculation of Illumination:

In general, illumination can be calculated by using the empirical formula:

$$N = \frac{E \times A}{\phi \times UF \times MF}$$

where,

N → Number of fittings required

E → Illumination required in lux

A → Area of the working plane in m2

Φ → Luminous flux produced per lamp in lumens

UF → Utilisation factor

MF → Maintenance factor