

# Lumen Method for Outdoor Calculations

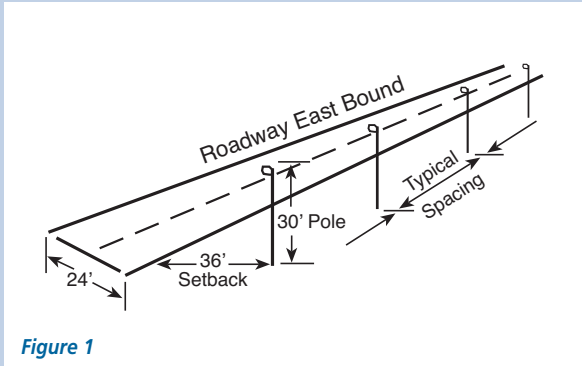


Figure 1

## Calculating average illuminance levels using a utilization curve

The standard Lumen Method formula is also used to calculate average illuminance levels in an outdoor area when CU's are taken from a utilization curve.

$$\text{Footcandles (maintained)} = \frac{\text{lumens/lamp} \times \text{lamps/luminaire} \times \text{\# luminaires} \times \text{CU} \times \text{LLF}}{\text{area in square feet}}$$

To calculate the number of luminaires needed to produce the desired footcandles, the following formula is used:

$$\text{\# of luminaires} = \frac{\text{maintained footcandles desired} \times \text{area in sq. ft.}}{\text{lumens/lamp} \times \text{lamps/luminaire} \times \text{CU} \times \text{LLF}}$$

A variation of this formula, which is used mostly for roadway lighting, calculates how far apart the fixtures must be spaced to produce the necessary average illuminance.

$$\text{Spacing} = \frac{\text{lamp lumens} \times \text{CU} \times \text{LLF}}{\text{Avg. mtd FC} \times \text{width of road}}$$

A utilization curve shows the percentage of light which falls onto an area having a designated width and an infinite length. This width is expressed on the utilization curve in terms of a ratio of the width of the area to the luminaire mounting height.

A CU is found by reading across the bottom axis to this ratio, up until the dashed CU line is intersected, then across to the right hand axis, to read the value of the CU. Separate CU's are given for the area to the street side (forward) and area to the house side (rear) of the fixture and may be used to find illuminance on the roadway or sidewalk areas, or added to find the total light on the street in the case of median mounted luminaires.

### Example:

A roadway 24 ft. wide is to be lighted to an average maintained illuminance level of 1.0 fc. Holophane Mongoose® MV400HPNC6 luminaires are to be used and mounted on 30 ft. poles that are set back 36 ft. from the road. Find the spacing required.

$$\text{Spacing} = \frac{\text{lamp lumens} \times \text{CU} \times \text{LLF}}{\text{Avg. mtd FC} \times \text{width of road}}$$

See Figure 1

### Solution:

The CU is determined by reading from Chart 1 the intersection of the distance across/mounting height with the CU and hence horizontally to the CU axis.

The CU for the roadway area only is determined by subtracting the CU of the setback area from the CU of the total area of both roadway and setback. The width of the total area is 60 feet ( 2.0 M.H.) and the width of the setback is 36 feet (1.2 M.H.). From the CU curve (see chart 1 ) we find that the corresponding CU's are .52 and .3. Deducting the second from the first we get a CU of .22. Inserting this CU into the standard Lumen Method formula results in a spacing of 371 feet.

$$\text{Spacing} = \frac{50,000 \times .22 \times .81}{1.0 \times 24} = 371 \text{ ft.}$$

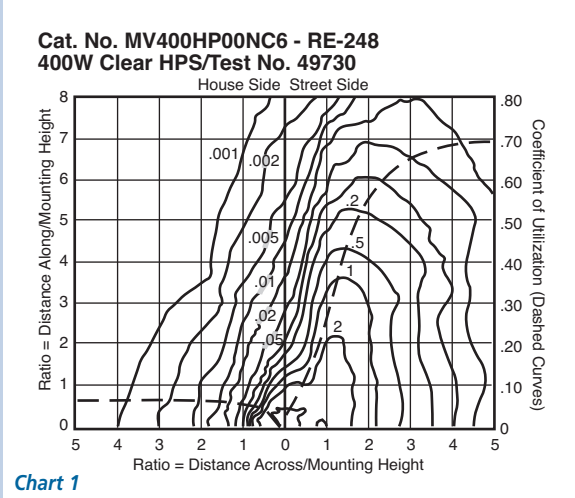


Chart 1



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*Illuminaire*, a retail innovation with unlimited options and accessories, including up/down lighting options, and the first offer of a 90% uplight option.