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Optimisation of Street Luminaries

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ABSTRACT: This thesis aims the installation of street luminaries at the optimized position and thereby reducing the total number of luminaries used. The reduced number of street light used will help in energy management and controlled manufacturing. The requirement and functions of luminaries varies from place to place and environment to environment. Generally the luminaries are fixed by electricians in a casual manner. There is no specific data that conveys the luminary installation people on the best position for the luminary for the respective places. Different street / pole lights are taken and analysed to get the best optimized positions. There by the efficiency of the luminary is perfectly utilized and the number of luminaries to be used are find out in exact number. Optimized luminaries also helps in decreasing the amount of energy used. Photometer is used to analyze the light intensities at varies positions. The best position is then analyzed and tabulated.

KEYWORDS: Street luminary, Efficacy, LED^[1], SMD^[6], Beam angle, Spill light.

I. INTRODUCTION

There is no specific data that conveys the luminary installation people on the best position for the luminary for the respective places. Different street / pole lights are taken and analysed to get the best optimized positions.

The energy efficiency of a lighting project is achieved either by intelligent control systems integration - regulating artificial light according to natural one - that uses last generation Led sources, optimizing consumption significantly compared to traditional sources.

Outdoor lights are usually different from those bulbs used indoors because they need to be much brighter and last longer. There are many different kinds of light bulbs used outdoors, and they each have pros and cons. Halogen bulbs are often found in homes as spotlights or floodlights, in cars as headlights, or at sports fields as stadium lights. These bulbs work in a similar way to an incandescent bulb by running electricity through a tungsten filament. Unlike the incandescent, there is halogen gas inside the bulb. When the tungsten burns off the filament, the gas re-deposits it back onto the filament to be reused. Halogen bulbs last much longer than incandescent, but these bulbs are much brighter and burn much hotter than traditional incandescent bulbs.

II. RELATED WORK

Aspects of street lightings includes under illumination, optimum illumination and over illumination. It refers to the situation in which, the required area to be illuminated is not completely light up^[4]. Several respective black spots and shadows are present in between the light sources, It is the situation in which, the required area to be illuminated is completely light up. No notable black spots and shadows are present at the streets, It is the situation in which, the required area is illuminated in excess amount than required, respectively. Secondary optics, lenses, are used to collimate the light rays into a controlled beam that will bring that full intensity to the area you need. Collimated light rays spread in parallel, although it is impossible to make the light perfectly parallel because of diffraction and the finite physical size of the bare emitter. It is important to note that the smaller the light source (emitter), the more effective the process will be.

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III. PROPOSED SYSTEM

The luminary is installed at three different heights on the pole with three different angle of inclination. The first set of reading is taken at a height of 10 feet on the pole with 0 degree inclination of the luminary. After that the inclination is changed to 45 degrees and there after it is changed to 70 degrees respectively.

The first set of reading is taken at a height of 15 feet on the pole with 0 degree inclination of the luminary. After that the inclination is changed to 45 degrees and there after it is changed to 70 degrees respectively.

The first set of reading is taken at a height of 20 feet on the pole with 0 degree inclination of the luminary. After that the inclination is changed to 45 degrees and there after it is changed to 70 degrees respectively.



Figure 1: Installation of proposed system.

Street luminaries are fixed on pole at different heights with different inclinations. Nine different sets of analysis are carried out in the field with three different distances on ground.

1. Parameters - 0 degree inclination, 10 feet high.
2. Parameters - 0 degree inclination, 15 feet high.
3. Parameters - 0 degree inclination, 20 feet high.
4. Parameters - 45 degree inclination, 10 feet high.
5. Parameters - 45 degree inclination, 15 feet high.
6. Parameters - 45 degree inclination, 20 feet high.
7. Parameters - 70 degree inclination, 10 feet high.
8. Parameters - 70 degree inclination, 15 feet high.
9. Parameters - 70 degree inclination, 20 feet high.

Values obtained and tabulated are as follows.

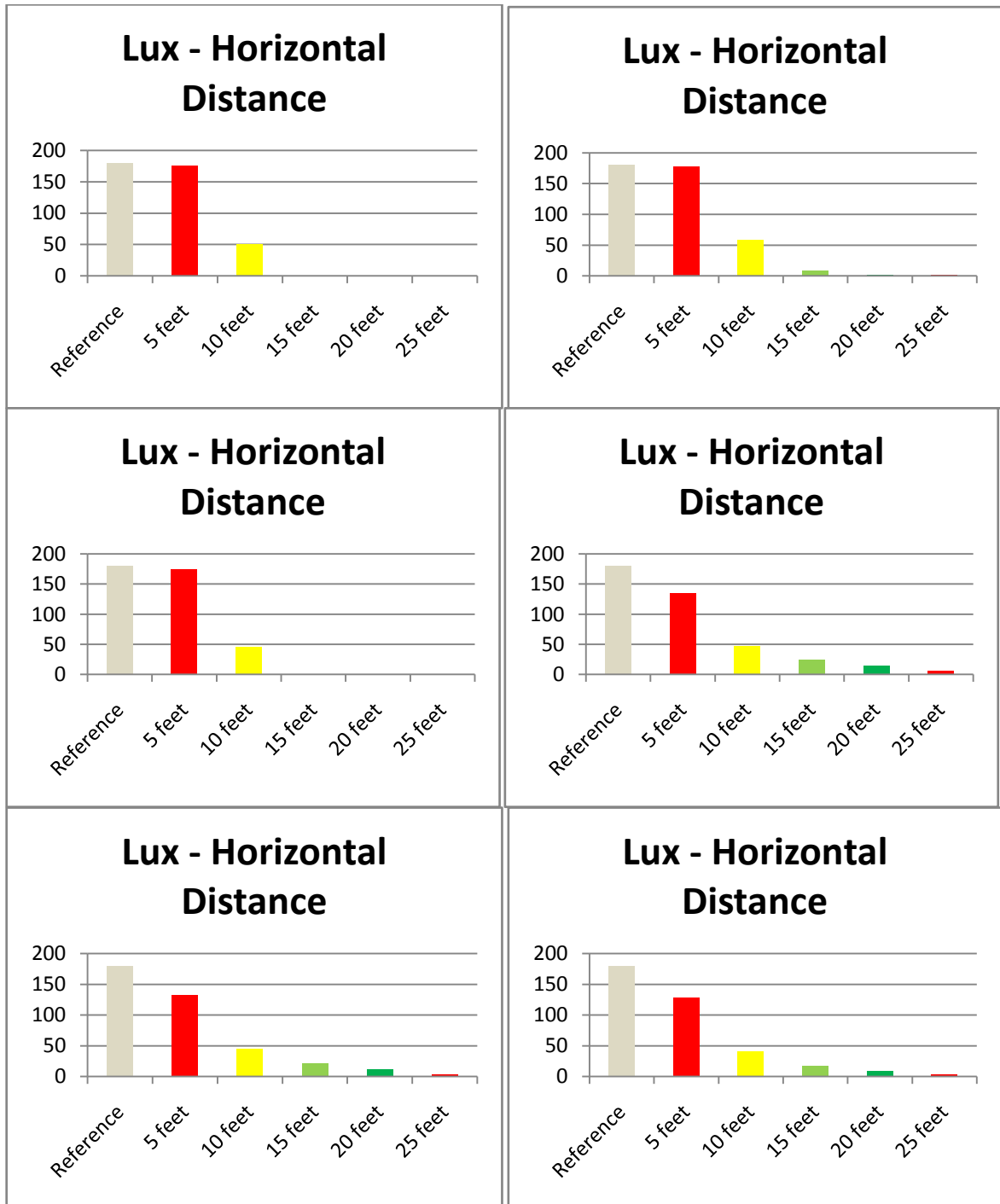
Graphs are plotted according to the lux meter readings corresponding to the above parameters.

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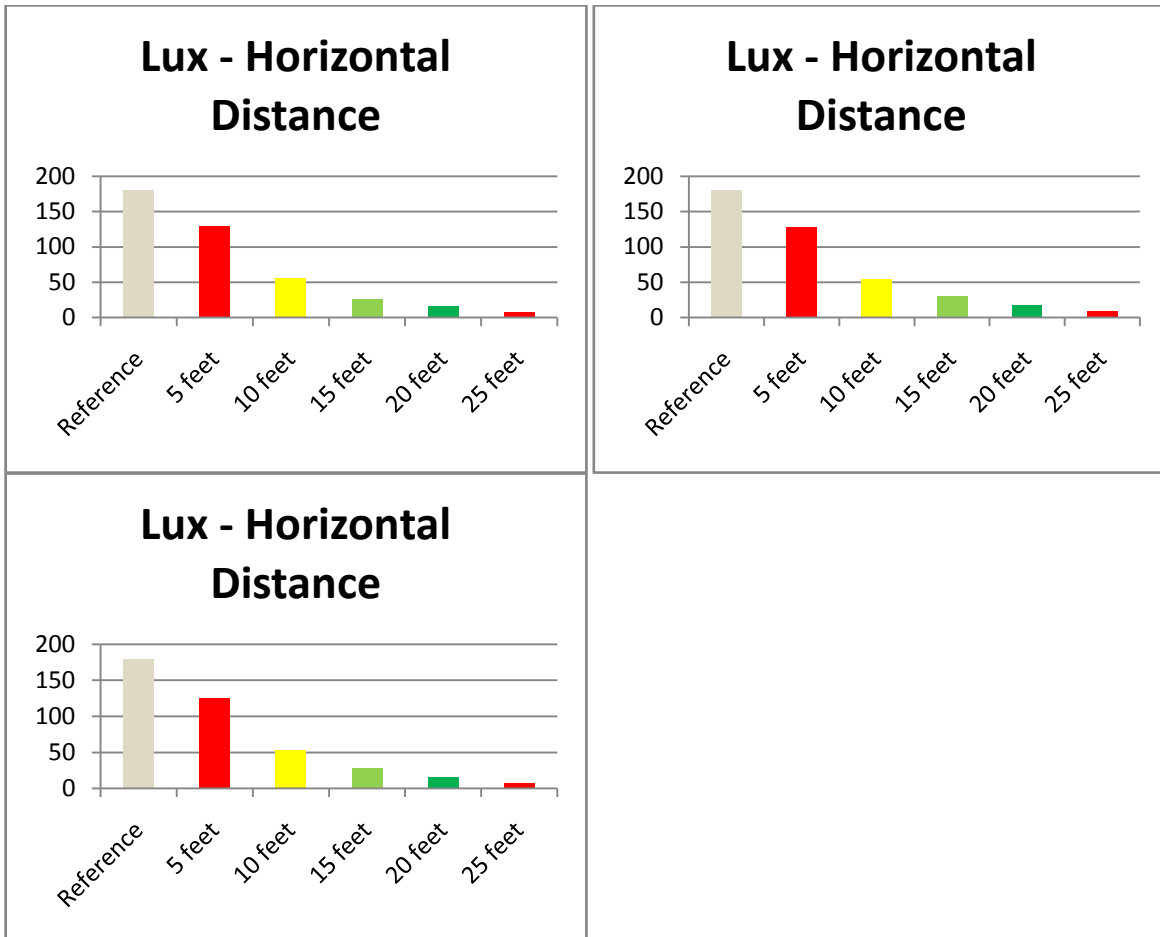


Figure 2: Graphs corresponding to different lux meter readings to the horizontal distances.

IV. EXPERIMENTAL RESULTS

Inference from bar diagrams.

It is very clear from the bar diagrams that the luminary fixed at 70 degree inclination and at a height of 15 feet shows the maximum lux when measured using lux meter at the optimum required area. So it is advised to install the street luminaries at the above stated condition. The test sample luminary is around 30watts and above 3000 lumens.

Inference from pie diagrams.

It is very clear from the pie diagrams that the luminary fixed at 70 degree inclination and at a height of 15 feet shows the maximum lux when measured using lux meter at the optimum required area. So it is advised to install the street luminaries at the above stated condition. The test sample luminary is around 30watts and above 3000 lumens.

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V. CONCLUSION

This paper focuses on the optimisation of the fixation of luminaries.

- Optimum position to fix luminaries is undoubtedly found out.
- Optimum number of luminaries required to light up an area is indirectly find out.
- Reduced the high initial investment for luminaries by reducing their total number.
- To avoid black spots optimum distance between luminary poles is find out.
- A solution to bring the complete area under light to ensure safety and visibility is achieved.
- Saving of electricity is figured.
- Reduced the total number of luminaries produced in total and there by energy management is achieved.
- By reducing the large production of luminaries, a push manufacturing system is changed to pull manufacturing system.

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