LOW COST SOLAR POWERED DAYLIGHT TUBE FOR RESIDENTIAL BUILDINGS IN SRI LANKA

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Abstract: Daylighting provide energy efficient lighting for buildings and also improve the mental wellbeing of the occupants. This research aims to develop a tubular daylight device suitable to be used to Sri Lankan houses in order to integrate daylighting to illuminate spaces where fenestration such as windows were not available. The developed model consisted of acrylic dome, light pipe and diffuser. In addition solar panels were integrated to the tube so that it can provide illumination with LED panel powered with solar power during nighttime. Once the installation was complete the illuminance levels were measured at a height of 0.8m from floor level. With the solar tube, illuminance level of 100-200 was observed during the day, in the 12' x 15' room. At night, the 30W LED light provided average of 150 lux around the luminaire at 0.8m from floor level . It was observed that the battery required two days to fully charge and the battery was able to supply power for the LED luminaire for 6 hours. The developed prototype was constructed with locally available material in order to minimize the cost, and the cost of the prototype was about 50% when compared with commercially available solar tubes. This system can be used as a sustainable lighting device which will improve the energy efficiency of the houses while providing the improved mental health to the occupants. The performance of the system can be further improved by increasing the capacity of solar panel and battery.

Keywords: Linear Daylight Tube, Solar Powered, Low Cost, Residential Buildings, Sustainability