Energy Efficient Task Light - DTU Orbit (13/12/2018)

Energy Efficient Task Light: Final report for PS 344-059

The objectives of this work is to develop a task light for office lighting that fulfils the minimum requirements of the European standard EN12464 - 1 : Light and lighting – Lighting of work places, Part 1: Indoor workplaces and the Danish standard DS 700 : Lys og belysning I arbejdsrum, or more specifically the requirements that apply to the work area and the immediate surrounding area. By providing a task light that fulfils the requirements for task lighting and the immediate surrounding area, the general lighting only needs to provide the illuminance levels required for background lighting and thereby a reduction in installed power for general lighting of about 40 % compared to the way illuminance levels are designed in an office environment in Denmark today. This lighting strategy is useful when the placement of the task area is not defined in the space before the lighting is design ed and the strategy also allows for the task area to be redefined in the space. The task lighting follows the task area as the developed task light is designed to be placed on the desktop of an office desk. The work carried out within this project is the architectural design of the task light, the optical design of the light distribution, prototype production and user tests for comparison between the prototype and traditional task lighting luminaires. The architectural design and user friendliness of the task light was a high priority within the project in order to promote market penetration of such a product. The height of the lamp head is aligned with respect to distribution and glare, which are two conflicting parameters. The broad distribution of the light requires a flat lamp head with the light source close to the bottom edge, while the desire to minimize glare is met by raising the lamp head and placing the light source as far from the bottom edge as possible. The main results of the project show opportunities for energy savings in an office environment by reducing the installed power for the general lighting by applying a task light with a wide light distribution across the desk area, providing high illuminance uniformity. There is still work to be done on the prototype to optimize the energy consumption of the task light and measures need to be taken to minimize glare from the task light as well as reflected glare. The lamp head adjustment possibilities regarding tilting and turning result in problems with glare and these adjustment possibilities should be eliminated in the final product. In general, the adjustment possibilities for height, length ways and sideways are important aspects for task lights, however they become less important when the light distribution is as wide as for the prototype. Using only standard components in the prototype, the optimal light distribution for the purpose of meeting the requirements could not be obtained. The light distribution was approximated to the requirements by using combinations of different beam shaping lenses. A final product would benefit from custom made lenses, capable of providing the desired light distribution. The user test shows that when working with general lighting of 100 lx in the room the developed task lig ht with its wide light distribution provides flexibility in choosing a reading task area on the desk and provides more visibility to all objects on the desk than the two traditional reference task lights with LED retrofit light bulbs. By utilising this new type of task light, the energy consumption by general lighting can be reduced by approximately 40 % by fully exploiting the lower illuminance levels required by lighting standards for the background lighting. The energy consumption of the task lights should be optimized for a wide light distribution while minimizing problems with glare.

General information
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