Lighting Perspectives
by Means of a New Water Blinds Shading System

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Abstract

Various transparent shading devices and systems based on the *Holographic Optical Elements* (HOE) technology, prismatic structures of glazing or perforated blinds have been designed for energy efficient buildings and also for convenient living conditions in them.

This study presents a new shading concept based on Water Prisms, comprising transparent containers of prismatic form filled with water (WP). Fig.1

The WPs should be placed as every other thermal efficient shading sytem in front of the glass façade. The blinds are supposed to provide upgraded visual conditions in the working environment enabling deflected daylight (direct from sun and diffuse from the sky) penetration into deeper zones of the rooms and balanced illuminance distribution. The space between the water prisms and the building's façade is expected to operate as a microclimate zone, where the heated water esacpes out of the slit of thw water prism, which lies at the upper edge of the prism and faces the façade of the building, working at the same time as an evaporative cooling device.

To show the effectiveness of WPs the following measurements are carried out using equipment placed in selected locations in a 3:20 scaled room-model with dimensions of 0.45x0.45x0.85m (in analogy to the real dimensions of 3x3x5.7m). WPs are placed south-orientated

1) Luminance distribution in the room by a digital luminance camera
2) Retinal illuminance levels at a height of 0.18 m (in analogy to the real height of 1.20 m) at the back of the room
3) Illuminance level at 0.12 m (in analogy to the real height of 0.80 m)
4) Thermal flux at floor and ceiling levels in the middle of the room.

Figure 1: Prismatic structure

Initial tests have shown the potential of WPs, when tested and compared with conventional tent and classical blinds using the same experimental set-up. The Water Blinds showed positive results such as:

1) Higher total daylight penetration through sunlight exploitation by redirection of light.
2) Thermal loads reduction as part of the thermal load will be absorbed by the water in the WPs and the remaining unabsorbed radiation will be deflected to the ceiling, way above the height of the occupants, optimizing the well-being effect in the building.
3) A microclimate will be created in the space between the glass facade of the building and the back side of the WBs through evaporative cooling which is enabled by the perforated slits at the edge of the blinds.
4) Safety and privacy enhancement (visual comfort) through view deflection.

For the above reasons WBSSs are promising elements in bio-climatic architecture. The research group is at the final stage of the experiments, which are necessary for the development of a fully tested Water-Blinds Shading System corresponding to the market's needs for specific climatic zones.