Dr. Renate Hammer

Daylighting in an Indoor Society

Speakers Profile

Born on 1969 in Vienna, Austria

Study and degree in Architecture at the Technical University, Vienna
Study in Philosophy at the University, Vienna

1988 – 1998 Diverse experience in architecture studios in Austria and Germany

Postgraduate Study in Urban engineering at the University of Tokyo
Postgraduate Study and degree of Solar Architecture at the Danube University Krems

Since 1998 employment at the Center for Architecture, Construction and Environment at the Danube University of Krems
Since 1999 self-employed as an Architect BAK
2009 doctorate degree in architecture at the Technical University, Vienna
Since 2011 Dean of the faculty for Education, Arts and Architecture at the Danube University of Krems

Abstract

Technological solutions for heating, cooling, mechanical ventilation and artificial lighting offered the chance for performing nearly every task indoors.Thus within only two generations our society by the majority moved indoors, with people spending over 92% of their lifespanin the interior. This change is of tremendous influence to human wellbeing and health, with human physiology being evolutionary adapted to the outdoorand now being forced to cope with significantly different conditions indoors. Various parameters like thermal comfort, air quality, exposure to substances and materials and,focused here, the radiation supply are affected.
A causal relationship between the evidence of epidemic occurrences of radiation deficiency disorders and extended periods of time spent indoors is supported within the presented study.This studycalculates the spectral distribution of outdoor solar radiation supply for a specific location and reference times. Radiation transmission through functional glazing was investigated for four glazing types. The resultingindoor radiation supply was broken down into its spectral distribution and folded with response curves representing particular human photobiologic processes. Special attention was given to pre-vitamin D3 photosynthesis, erythema formation, melatonin suppression, and light sensitivity in photopic vision conditions. The calculated response potentials were compared with threshold values, and effective doses.
It is clearly shown that indoors the ultraviolet radiation spectrum is reduced beyond the threshold necessary for the process of previtamin D3photosynthesis. Moreover both the threat of erythema formation as well as the chances of skin adaptation is remote. In the visible light spectrum the photophysiologicalrelevant threshold values are significantly exceeded for all presently known non-visual indirect effects of melatonin suppression but only if direct light is available and the spatial configuration of the room is appropriate.
Based on these outcomes, a number of design aids are indevelopment to support the planning of physiologically sufficient daylight supplied interior, such as the "Light Penetration Factor" or prediction tools for Previtamin D3 synthesis linked to the sun path diagram.

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