P-02 | Optimizing Daylighting: Exploring Visual and Non-Visual Effects through Weather, Orientation, and Location

COA SHOWCASE

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This research project presents a comprehensive analysis of the daylight performance in a standard office across twelve different locations. The assessment covers both the visual and non-visual impacts of daylight, considering such as vision, glare, view quality, and circadian rhythms. Evaluation criteria are based on the prerequisites for daylight and view credits outlined in LEED v.4 [1], in conjunction with the WELL 2.0 Building Standard [2] for daylighting evaluations. The assessed space is outfitted with sidelight windows, representing a typical section of an office within a multi-story building. Twelve locations were chosen, ranging from latitudes 0º to 65º in the Northern Hemisphere. These locations represent a variety of climates, featuring distinct sky conditions that vary from predominantly clear skies (e.g., Phoenix) to consistently overcast skies (e.g., Caracas and Anchorage). Moreover, they experience varying durations of daylight throughout the year, with shorter daylight hours in winter days (around 7.5 hours) and longer summer days (up to 18 hours).

The study's findings shed light on how daylight performance is influenced by geographical location, prevailing weather conditions, window dimensions, shading devices, glass transmittance, and floor plate depth [3]. Notably, the study demonstrates the feasibility of designing spaces that meet the daylight and view credit criteria of LEED v.4 while complying with the circadian lighting requirements of WELL 2.0 in diverse locations. Designing for circadian lighting demands a meticulous approach to window system design, aiming to provide bright light, preferably from reflected sunlight bouncing off shading devices and interior reflectors towards the ceiling. Balancing the control of sunlight without compromising outdoor views poses a challenge for architects and lighting designers worldwide. Leveraging daylight has the potential to significantly enhance the quality of life and the overall health of building occupants.