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I.T. Kim, A.S. Choi, M.K. Sung



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Development of a Colour Quality Assessment Tool for Indoor Luminous Environments Affecting the Circadian Rhythm of Occupants

IT Kim MS^a, AS Choi Ph.D^a*, MK Sung Ph.D^a

^a Department of Architectural Engineering, Sejong University, Kunja-Dong, Kwangjin-Gu, Seoul, Korea 143-747

* corresponding author. e-mail: aschoi@sejong.ac.kr; fax: +82-2-3408-4331

Abstract. – The colour of indoor luminous environments affects the circadian rhythm and awakening of humans. If the blue colour of a luminous environment perceived by an observer's circadian action factor (CAF), which represents the impact of light on the hormones and biorhythm of an observer, is high, the secretion of melatonin is suppressed. To design an appropriate indoor luminous environment, the final colour of a space perceived by an observer must be accurately predicted and its effects on the observer must be considered. Therefore, this study developed a Colour Quality Assessment Tool (CQAT) that utilizes the spectral reflectance factor of interior finishes and the spectral power distribution (SPD) data of luminaires to accurately calculate the luminous exitance radiated by interior finishes and the colour quality components of the SPD, luminance, CAF, colour coordinates, and correlated colour temperature (CCT) based on the colours of the interior finishes and light sources. In addition, the colour quality was evaluated considering the angle between the interior finishes and the view of an observer from a specific direction and position. The colour quality of different interior finishes was assessed using the CQAT, and the results showed that the luminous environment CCT perceived by observers differed by 1,882 K (approximately 31%) or more and that the CAF differed by 0.16 (approximately 14%) or more based on the colour of the interior finishes.

Keywords. - Colour Quality Assessment, Circadian Action Factor, Interior Material, Spectral Reflectance

Abbreviations

CAF	Circadian action factor
CQAT	Colour quality assessment tool

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