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Arnold Wilkins comments on the Proposed 2022 Energy Code

Comments on the proposed 2022 Energy Code.

Additional submitted attachment is included below.

Re: 21-BSTD-01 2022 Energy Code Update Rulemaking
Recommendation to reverse the changes to Sections 150.0(k)1B, 160.5(a)1B and Tables 150,0-A and 160.5-and support quality residential lighting

Comments from a lighting specialist

1. Why is it good to have light sources that are low flicker?
   Fluorescent lighting with magnetic ballast flickers at twice the supply frequency and is known to cause headaches[1] and impair visual performance[2]. The depth of modulation from LEDs can be greater than that from fluorescent lighting.
2. Is 30% amplitude modulation for frequencies less than 200 Hz acceptable?
   It has recently been shown that during a rapid eye movement (saccade) the brain uses the moving image to guide subsequent eye movements[3]. The moving image is impaired by flicker, even flicker at very high frequencies and low modulation depths. 30% amplitude modulation at 120Hz (as from fluorescent lamps) is known to impair visual performance.[2] The 30% limit does not sufficiently protect health, although it is better than nothing.
3. Would there be any benefit in requiring that companies have to publish their flicker test results?
   The publication of flicker test results would incentivize healthy lighting.
4. There is a need for more restrictive flicker standards.
   It is now known that some individuals can see flicker as a fleeting pattern during a rapid eye movement (saccade). Some individuals can see the pattern at flicker frequencies as high as 11kHz. These individuals tend to be those who report eye strain in everyday life, raising the possibility of a causal relationship between eye-strain and very rapid flicker.[4]
5. The changes envisaged are major and have not been subject

to the detailed analysis and public review that has occurred with other major changes.

6. The rationale for the changes in the initial statement of reasons does not evaluate the ramifications of the change. Careful evaluation should take place next code cycle.

Professor Emeritus Arnold Wilkins

University of Essex, UK

References

(1) Wilkins, A. J.; Nimmo-Smith, I.; Slater, A. I.; Bedocs, L. Fluorescent Lighting, Headaches and Eyestrain. *Light. Res. & Technol.* **1989**, *21* (1). https://doi.org/10.1177/096032718902100102.

(2) Veitch, J.A., & McColl, S. L. Modulation of Fluorescent Light: Flicker Rate and Light Source Effects on Visual Performance and Visual Comfort. *Light. Res. Technol.* **1995**, *27*, 243–256. https://doi.org/10.1177/14771535970290010401.

(3) Schweitzer, R.; Rolfs, M. Intra-Saccadic Motion Streaks Jump-Start Gaze Correction. *bioRxiv* **2020**, 2020.04.30.070094.

(4) Brown, E.; Foulsham, T.; Lee, C. S.; Wilkins, A. Visibility of Temporal Light Artefact from Flicker at 11 KHz. *Light. Res. Technol.* **2019**, 371–376. https://doi.org/10.1177/1477153519852391.