KAN Kommission Arbeitsschutz und Normung

KAN position paper on artificial, biologically effective lighting and standardization

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For further information on the topic of artificial, biologically effective lighting, visit www.kan.de/en/what-we-do/lighting/

1 KAN Position

Workplaces must be illuminated such as to facilitate work that is economically viable, safe, and conducive to good health.

Light in all its forms has a biological effect upon human beings – irrespective of the type and source of illumination, and of whether biological effects are caused incidentally by conventional lighting or by forms of illumination planned and used intentionally for this purpose. All of these effects are associated with opportunities and risks for occupational safety and health.

Where used intentionally and selectively to trigger biological effects, artificial lighting is now referred to as human-centric lighting (HCL[1]), particularly by the lighting industry.

The position of the Commission for Occupational Health and Safety and Standardization (KAN) regarding artificial, biologically effective lighting is as follows:

- The subject of artificial, biologically effective lighting impacts upon the safety and health of workers at work. If the development of standards or launching of a standardization work item is envisaged in this area, the permissibility of the standards must first be reviewed in accordance with the Policy paper on the role of standards in the safety and health of workers at work.
- Standards may describe product requirements for components of the lighting installation (such as lamps, luminaires and control units); manufacturers are to be called upon in the section of the standard governing the user information to provide the necessary information on the intended use of the lighting installation and if possible on risks associated with its use.
- Manufacturers of and dealers in artificial, biologically effective lighting systems must provide information in the user information on possible hazards.
- The content of DIN SPEC 67600:2013-04 (technical report), Biologically effective illumination – Design guidelines[2], which has already been published, is based in part upon inadequately validated findings.[3] Consequently:

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[1] *"Light always has a variety of effects: visual, emotional and biological. Human-centric lighting (HCL) reinforces human health, well-being and performance purposefully and in the long term, through comprehensive planning and exploitation of the visual, emotional, and in particular biological effects of light."* ZVEI position paper (use of human-centric lighting (HCL) makes the right light available at any time of the day), September 2016

[2] The DIN SPEC 67600 technical report was produced by the NA 058-00-27 AA working committee, Effect of light on human beings, of the DIN Standards Committee Lighting Technology (FNL) in accordance with the technical report procedure.

    - Misinterpretation during application of the standard cannot be ruled out.
    - Reference should logically not be made to DIN SPEC 67600 (technical report) in other standards or specifications.
    - The planning recommendations formulated in DIN SPEC 67600 (technical report) do not constitute a validated basis for implementation in companies of the German ASR A3.4 technical rule concerning lighting.
- Planned exploitation of the biological effect of artificial light is permissible only when adequate consideration is given to safety and health at work. This means that:
    - Selective exploitation of the biological effect of artificial light must not give rise to additional health hazards over and above those presented by conventional lighting.
    - Selective and planned exploitation of the biological effect of artificial light must assure visual comfort and visual performance.
- Findings in the sphere of the biological effect of artificial light must be examined regarding whether they are adequately validated or can reasonably be accepted:
    - The findings must be identified that constitute a suitable basis for the identification of hazards to the safety and health of workers and of opportunities for prevention.
    - Relevant findings must feed into the documents made available by the OSH bodies to a range of stakeholders (including operators, planners and workers).
    - KAN welcomes the assumption of work on information documents by the DGUV Lighting sub-committee and the responsible working group in the AStA state committee for workplaces.
- OSH-related research should be conducted.
- Dialogue between all stakeholders should be maintained.
- KAN's position on artificial, biologically effective lighting should be reviewed at annual intervals and brought into line with developments as appropriate.

[3] The International Commission on Illumination (CIE) has also stated in its position paper that the scientific findings are not yet sufficient for planned exploitation of the biological effect of artificial light: CIE Statement on Non-Visual Effects of Light, "Recommending proper Light at the proper Time" (2015).

2 Definition and relevance to human beings

Light has two functions for human beings. It enables them to see, and also has non-visual effects. These non-visual biological effects of light are defined in DIN SPEC 5031-100:2015-08 (prestandard), Optical radiation physics and illuminating engineering – Part 100: Melanopic[4] effects of ocular light on human beings – Quantities, symbols and action spectra[5].

Any source of light also has a biological effect. This applies both to natural daylight and to artificial lighting. The effects are characterized in their nature and magnitude by certain light-related parameters, the timing and duration of effect, and personal human characteristics (such as "early birds" and "night owls"). The intensity and spectral components of natural daylight change during the course of the day. The biological effects vary accordingly. Artificial lighting is able to emulate components of daylight and to exert similar non-visual effects. Comprehensive emulation of daylight is not possible at the present time. The use of natural daylight is therefore of great importance from a health perspective and should be given preference over the exclusive use of artificial light.

3 Relevance of lighting for occupational safety and health

Natural, biologically effective lighting in the form of daylight is an important factor for safe and healthy workplaces. Where adequate natural daylight is not available, artificial lighting alternatives must be created where possible. The opportunities and risks resulting from planned exploitation of the biological effect of artificial light require further scientific study. Adequate consideration must be given to existing and future findings.

Light is now assumed to have a far greater effect upon upon human health, performance, well-being and concentration than was ascribed to it even only a few years ago. Light is consequently also related to safety and the incidence of accidents at work.

Occupational safety and health is based upon validated ergonomic findings. Numerous studies already exist into discrete effects of artificial, biologically effective lighting. Robust conclusions may be drawn from these studies for

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[4] This position paper uses the term "biological effect" rather than "melanopic effect".

[5] *3.1 Melanopic effects of light*

Non-visual effects upon physiological and psychological processes in the human organism facilitated by the intrinsically photosensitive retinal ganglion cells (ipRGCs)

occupational safety and health, for example with regard to certain times of the day. Further OSH-related research is also required, particularly regarding night work.

Lighting installations employing artificial, biologically effective lighting must always aim to facilitate workplaces being economically viable, safe and conducive to good health. Where lighting systems (conventional and modern) are used inappropriately they may give rise to health hazards, for example during night or shift work.

In KAN's view, the following must be considered at present with regard to the illumination of workplaces:

- The illumination of working premises must satisfy the rules and regulations governing the safety and health of workers.
- The use of natural daylight at workplaces should be given preference over artificial lighting in the first instance.
- Should insufficient natural daylight be available at workplaces, selective and planned exploitation of the biological effect of artificial light may be advantageous.
- The performance of work without (adequate) natural daylight and the selective exploitation of artificial, biologically effective light may present health risks. This aspect of lighting must therefore be considered during risk assessments.
- The selective and planned exploitation of the biological effect of artificial light must also be considered from an ethical perspective: workers should for example be informed of its use and the reasons for it.
- Where artificial, biologically effective lighting is controlled individually by the user, health risks resulting for example from misuse and false assessment by the user him or herself must be excluded.