DIN/TS 67600:2022-08 (E)

Complementary criteria for lighting design and lighting application with regard to non-visual effects of light

Contents

Page

Foreword ... 5
Introduction ... 7
1 Scope ... 9
2 Normative references ... 9
3 Terms and definitions ... 10
4 Extended planning ... 10
5 Target variables ... 11
6 Criteria related to non-visual effects of light ... 12
6.1 General ... 12
6.2 Spectral composition of light ... 14
6.2.1 General ... 14
6.2.2 Spectral evaluation of light ... 15
6.2.3 Age dependency of the eye ... 18
6.2.4 Optical properties of materials ... 19
6.3 Illuminance ... 31
6.4 Spatial distribution of light in the room ... 32
6.4.1 General ... 32
6.4.2 Area size and solid angle ... 32
6.4.3 Light direction ... 33
6.5 Dynamics of light ... 33
6.5.1 General ... 33
6.5.2 Light adapted to the time of day ... 34
6.5.3 Seasonally adapted light ... 35
6.5.4 Timing and duration of light exposure ... 35
6.5.5 Spectral and spatial distribution of light over time ... 36
6.5.6 Rapid changes of light ... 36
6.6 Energy efficiency of melanopically effective illumination ... 36
6.7 Control of lighting systems ... 36
7 Considering non-visual effects in lighting design ... 37
7.1 General ... 37
7.2 Tasks to be fulfilled by the designer ... 38
7.3 Structure and course of a daily routine (model day with some flexibility) ... 42
8 Documentation, instruction, commissioning ... 48
9 Operation and maintenance of lighting installations ... 50
Annex A (informative) **Checklists and examples for applications** ... 51
A.1 Checklist for planning of a non-visually effective lighting system ... 51
A.2 Examples for applications ... 52
A.2.1 Introduction ... 52
A.2.2 Private living spaces ... 52
A.2.3 Places for teaching and learning ... 53
A.2.4 Offices ... 55
A.2.5 Control rooms ... 57
A.2.6 Elderly care and nursing homes ... 58
A.2.7 Healthcare facilities ... 62
A.2.8 Hotel rooms ... 63
A.2.9 Shift work ... 64
Bibliography ... 67

Figures

Figure 1 — Visual pathway, retinohypothalamic tract and non-visual pathway. The visual pathway leads from the eye via the optic nerve to the visual cortex in the brain. The retinohypothalamic tract (RHT) leads from the eye to the suprachiasmatic nucleus (SCN). From the SCN, signals are transmitted to the pineal gland via sympathetic fibres in the spinal cord and superior cervical cord ganglion. The RHT, SCN and sympathetic ganglia form the non-visual pathway. **8**
Figure 2 — Melanopic factor $a_{\mathrm{mel,\,v}}$ and MDER according to DIN/TS 5031-100 as a function of their correlated colour temperature for various illuminants **16**
Figure 3 — Visual and melanopic transmittance of different materials listed in Table 6, Table 7 and Table 8 ..... **24**
Figure 4 — Visual and melanopic reflectance of selected materials for different illuminants according to Table 10 ..... **30**
Figure 5 — Example of the change in colour temperature, vertical illuminance and MEDI during the course of the day, measured in a northern compass direction, without direct solar radiation (CEST on May 1, 2009, 48° 8′ 14″ north latitude, 11° 34′ 32″ east longitude) **34**
Figure 6 — Melanopic equivalent daylight illuminance MEDI [lx] **38**
Figure 7 — Typical course of melanopic equivalent daylight illuminance in daylight **43**
Figure 8 — Examples of the course of illuminance at the eye approximating the natural course of daylight **45**
Figure 9 — Examples of the course of the correlated colour temperature (CCT) at the eye in approximation to the natural daylight **47**
Figure A.1 — Example of time-of-day-dependent lighting dynamics as realised in the lighting design in an evening school. Presentation of different phases of the day with regard to their relevance for non-visual lighting effects **55**
Figure A.2 — Example of a daytime-dependent lighting dynamic taken from a lighting design for an office. This example assumes sunrise at about 06.00 a.m. and sunset at about 08.00 p.m. **56**
Figure A.3 — Daytime-dependent lighting dynamics taken from a lighting design for a retirement and nursing home or hospital. Representation of different phases of the day with regard to their relevance for non-visual lighting effects. **59**
Figure A.4 — Example of a lighting solution for care oases **60**
Figure A.5 — Example of time-of-day-dependent lighting dynamics for staff rooms, duty rooms and work areas in intensive care **63**