

NSVV CIE informatie dag Workshop Divisie 3 "Interior environment and lighting design"

Gilles Vissenberg, January 22nd 2018



DIVISION 3: TECHNICAL COMMITTEES

3-53 Revision of CIE S 008 Joint ISO*CIE Standard: Lighting of Work Places - Part 1: Indoor	Adrie de Vries
3-54 Revision of CIE 16-1970: Daylight	Alexander Rosemann
3-55 Metrics for sunlighting and daylight passing through sunshading devices	
3-56 Assessment of Discomfort Glare from Daylight in Buildings	
JTC 04 (D3/D6) Visual, Health, and Environmental Benefits of Windows in Buildings during Daylight Hours	
JTC 06 (CIE-ISO) Energy Performance of Lighting in Buildings	Adrie de Vries/ Alexander Rosemann
JTC 07 (D3/D1) Discomfort caused by glare from luminaires with a non-uniform source luminance	Gilles Vissenberg
JTC 08 (D1/D2/D3/D4/D5/D6/D8) Terminology in light and lighting	
JTC 09 (D1/D2/D3/D6) CIE system for Metrology of ipRGC influenced light response	
JTC 11 (CIE-ISO) Light and Lighting – Maintenance factor – Way of working	Adrie de Vries



DIVISION 3 PUBLICATIONS

CIE 227:2017 Lighting for Older People and People with Visual Impairment in Buildings	Adrie de Vries
CIE 222:2017 Decision Scheme for Lighting Controls in Non-Residential Buildings	Gilles Vissenberg
CIE 218:2016 Research Roadmap for Healthful Interior Lighting Applications	Adrie de Vries



Agenda

- 13:00-13:05 Introductie (Gilles Vissenberg)
- 13:05-13:25 Adrie de Vries:
 - Light for Elderly
 - Healthful lighting
 - Workplace requirements
 - Maintenance Factor
- 13:25-13:35 Alexander Rosemann:
 - Energy performance
 - Daylight
- 13:35-13:50 Gilles Vissenberg:
 - Discomfort glare (UGR correction)
- 13:50-14:00 Discussie over Divisie 3 onderwerpen



- Lighting for older people and people with visual impairments in buildings
- Research roadmap for healthful interior lighting applications
- Lighting for indoor workplaces
- Maintenance factor determination way of working
- Maintenance factor full revision



(formerly) TC3-44

Lighting for older people and people with visual impairments in buildings

CIE 227:2017



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Lighting for older people and people with impaired vision in buildings

Content overview

- Literature review
 - Age related changes
 - Lighting requirements based on visual models
 - Lighting requirements for older people to move through escape routes
 - Disability and discomfort glare
 - Non visual aspects
 - Recommendations for practical lighting solutions
 - Design guides





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Lighting for older people and people with impaired vision in buildings

<	Ratio 1: Ratio of average illuminance on the task area depending on age, visual task complexity, and failure risk Ratio 1: Ratio of average illuminance on the immediate surrounding of the task area to average illuminance on the task area		Ratio 2: Ratio of average illuminance of the background to average illuminance on the task area				
E_{av}	U_{\circ}	Eav	U_{o}	Ratio 1	U_{\circ}	Ratio 2	Uo **
750	0,60	750 -1 000 -1 500*	0,60	0,65	0,50	0,20	0,30
500	0,60	500 - 750 - 1 000*	0,60	0,65	0,50	0,20	0,30
300	0,60	300 - 500 -750*	0,60	0,65	0,50	0,20	0,30
200	0,60	200 - 300*	0,60	0,75	0,50	0,20	0,30
150	0,50	150	0,50	1,00	0,50	0,20	0,10
100	0,40	100	0,40	1,00	0,40	0,20	0,10
≤50	0,40	≤50	0,40	1,00	0,40	0,20	0,10
 Range of higher levels depending on factors like age or risk of falls which will influence the light level. 							

** Illuminance in peripheral areas of a room tends to be less uniform than that in the other area. To avoid the use of extra luminaires in the peripheral areas including the corners, a strip of 50 cm adjacent to the surrounding walls may be disregarded in uniformity calculations.

 Table with indications of what light levels to choose depending on age, visual task and complexity.



(formerly) TC3-46

Research Roadmap for Healthful Interior Lighting Applications

CIE 218:2016



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Research Roadmap

for Healthful Interior Lighting Applicatio

Intent

Document which provides an overview of scientific topics related to healthful interior lighting applications and indicate where the current gaps in knowledge is.

To be used by

- Research institutes
 - Independent
 - industry
- PhD students
- Lighting community

Based on CIE 158:2004 (Occular Lighting effecs on human psychology and behavior)





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Research Roadmap

for Healthful Interior Lighting Applications

Content overview

Based on CIE 158:2004 (Occular Lighting effecs on human psychology and behavior)

• Research agenda

- Total light exposure
- Light-dark rhythms
- Spectral properties
- Light received at the eye
- Timing of exposure
- Glare and Flicker
- Individual differences
- Research methodology
- Further application considerations





TC3-53

Revision of CIE S008 Lighting for indoor workplaces



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Revision of CIE S008 Lighting of indoor workplaces

Intent

Review and revise CIE S008 Lighting of indoor Workplaces to incorporate new insights and harmonize with CEN standards.

Highly related to EN12464-1

Relevant areas

- General indoor areas
- Industrial facilities
- Offices
- Retail
- Healthcare facilities





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Revision of CIE S008 Lighting of indoor workplaces

Current status

- Work started mid-2013
- First and second rounds of committee commenting were done (2015/2016)
- Still waiting for a possible transfer to ISO, timing unclear





CIE JTC 11 / ISO TC274 JWG 3 Joint ISO/CIE working group

Maintenance factor determination Way of Working



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Intent

Create a clear way of working to determine the maintenance factor based on current technologies.

Based on CIE 097:2005 and CIE 154: 2003

To be used by

- All parties involved in lighting design
 - Lighting designers
 - Installers
 - Specifiers
- Governments
- Municipalities



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Content overview

- Overall methodology
- Detailed description of how to determine the individual factors
 - Relabeling to assure its independent of technology
 - Link to relevant IEC standards
 - Explanations on specific technologies such as Constant Light Output
- Verification
- Examples (in Annex)

Status/planning

- Currently in CIE 'Enquiry Draft' phase (commenting phase)
- Planned to have final approval vote starting May/June 2018
- Publication ready second half 2018



CIE JTC ... (13?) Division 3 +4

Maintenance factor Revised methodology



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Intent

Completely revise the maintenance factor determination methodology

Some thoughts from the chair:

- Consider non-recoverable losses
- Separate product from application features
- Effects on luminous intensity distributions

To be used by

- Update of TS 22012 (JTC 11 / ISO JWG 3)
- Research organizations

Planning

- Started October 2017
- Proposed end-date 2021





JTC 06 (CIE-ISO) Energy performance of Lighting in Buildings

Background – History (*incomplete*)

- 2002: European Directive on Energy efficient buildings (include lighting & daylighting!)
- 2006: National standards on energy performance in buildings
- 2007: European standard energy performance in buildings
- 2011: Canadian building code includes the same methodology for lighting energy use fitted to Canadian conditions
- 2014: Canadian National Standard BEEM Building Energy Efficiency Methodology aligned with European approach
- 2015: New JTC (ISO-CIE) established to work on ISO standard



JTC 06 (CIE-ISO) – Membership - update

(FR)

(NL)

(AU)

(SK)

(DE)

(CAN)

(S)

(J)

(DE)

(IR)

(IT)

(IR)

- Convenor (ISO): Moghtader, Sohéil Co-convenor (CIE): Rosemann, Alexander (NL)
- Experts:
 - Beu, Dorin (RO)
 - Choi, An Seop (KR)
 - Cornelius, Wolfgang (DE)
 - Coursière, Nathalie
 - Daams, Job (NL)
 - de Boer, Jan (DE)
 - de Vries, Adrie
 - Dehoff, Peter
 - Gasparovsky, Dionyz
 - Govén, Tommy
 - Kirsch, Raphael
 - Lau, Toby
 - Miki, Yasuhiro
 - Minnerup, Jörg
 - Moslehi, Hamid
 - Pagano, Fabio
 - Rahmatian, Zahra

- Rauwerdink, Kay (NL)
- Rosemann, Alexander (NL)
- Schrader, Björn (CH)
- Thorns, Peter (UK)
- Tuaycharoen, Nuanwan (THA)
- WANG, Shuxiao (CN)
- ZHANG, Wei (CN)





JTC 06 (CIE-ISO) - Goal

- Develop an ISO Standard, describing the methodology to determine the energy consumption for lighting in a building
- Starting point: (new) EN15193-1
- Alignment with ISO 10916
 "Calculation of the impact of daylight utilization on the net and final energy demand for lighting"





JTC 06 (CIE-ISO) – Progress & Next Steps

Among others:

- 2015-11 Expert meeting at TU/e in Eindhoven
- 2017-06 ISO TC and JWG meeting in Delft
- 2017-12 Telecon on comments received
- 2017-01-31 WG meeting in Berlin, Germany to finalize document based on comments received.

Most discussions are on editorial items, very few technical comments, no *insurmountable* issues

→ Full alignment with European and Canadian approach. Asian members support the methodology



TC 3-54 Revision of CIE 16-1970: Daylight

• Terms of Reference:

"To revise and update publication CIE 16-1970: Daylight in the light of the advances in technology and design since 1970."

- 2012-08: approved
- Initial set of experts from Europe, North America, South America, Asia
- Difficulties related to CIE membership issues required a re-organization of the TC structure

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For	CIE 16-1970			
	Photocopy Edition 199	6		
	UDC: 628.921 628.922 628.924 628.928	Descriptor: Daylight, design Side lighting Fenestration Top lighting		



TC 3-54 – Current Developments

- 2016-10-04 New TC Chair nominated: Alexander Rosemann
- TC membership adapted over time and adding new members. Now, Africa is also represented (Expert: Dolf Bakker).
- Started fresh and followed the established CSA approach of dividing the work further into Task Forces (TF)

Claudia Amorin BR Francesco Anselmo UK Stanislav Darula SK **SLO** Matej Kobav UK John Mardaljevic Barbara Matusiak Ν Anna Pellegrino IT NL Alex Rosemann Paulo Scarazzato BR CH Miroslav Fabian **Dolf Bakker** ZA



TC 3-54 – Structure

Part 1	Part 2
 General introduction on daylighting Description of the daylighting design process Daylight definitions Climate variability Site layout Indoor daylighting Design data (parameters, variables, etc.) Perception of daylighting and sunlight Glare Perception of external environment (view) Daylight-dependent Control Selection of the right daylight system for the right application 	 Desired daylighting conditions Space distribution, Time distribution, Quantity, Quality Application related metrics a. Earlier design phases b. Later design phases Cross references to other standards Appendices: a. Daylighting edit design b. Description of simple calc methods c. Measurements in situ d. Measurements in models e. Design Checklist and/or Decision Tree



TC 3-54 – Progress and Next Steps

Slightly more challenging...

Voluntary work often gets pushed to the lower end of the priority list and does not get much higher within a reasonable time.

Identified challenge for the TC Chair: continuously reminding and motivating the TC to contribute.

Anecdote: The TC working towards the publication CIE 16-1970 was kicked off in Paris in
September 1957
We aim to get this work done in (slightly?) less time.

Discomfort glare at CIE2017 in Jeju, Korea

Ramada Ballroom III 053 Glare Chair: Gilles Vissenberg, NL OP11 GENERIC GLARE MODELS FOR PREDICTING NON-UNIFORM AND COLOURED LED SOURCES Ming Ronnier Luo, CN OP12 DISCOMFORT GLARE FROM DAYLIGHTING: INFLUENCE OF CULTURE ON DISCOMFORT GLARE PERCEPTION Clotilde Pierson, BE OP13 AGEING EFFECTS ON DISCOMFORT GLARE SENSATION AND THEIR MECHANISMS Yukio Akashi, JP OP35 COMPARISON OF LUMINANCE BASED METRICS IN DIFFERENT LIGHTING CONDITIONS Jan Wienold, CH OP15 EFFECTS OF TASK AND VIEWS ON DISCOMFORT GLARE FROM WINDOWS Toshie Iwata, JP Discussion

Parallel session

Workshop



Discussion topics:

Effect of

- Colour
- Source uniformity
- Age
- Task

How to evaluate the glare experience? How to compare different glare measures?

Technical committee meetings:

TC2-86 (measuring glare) TC3-56 (Daylight) TC4-33 (road lighting) JTC7 (source uniformity)

D3 annual meeting:

Proposal to have a 1 or 2-day conference on discomfort glare in 2019

Discomfort glare by interior lighting luminaires with a non-uniform source luminance

JTC7

CIE info dag TUE Eindhoven

January 22nd 2018

Gilles.Vissenberg@philips.com

Discomfort glare according to the norm

	NEN-EN 12	2464-1:2011		
EUR NOR	OPEAN STANDARD ME EUROPÉENNE	EN 12464-1		
EUR	OPÄISCHE NORM	June 2011		
ICS 91.1	160.10	Supersedes EN 1	12464-1:2002	
English Version Light and lighting - Lighting of work places - Part 1: Indoor work				
Lumière	et éclairage - Eclairage des lieux de travail - Partie 1: Lieux de travail intérieurs	Licht und Beleuchtung - Beleuchtung von Al Teil 1: Arbeitsstätten in Innenräun	rbeitsstätten - nen	
This Euro	opean Standard was approved by CEN on 14 April 201	1.		

Table 5.26 — Offices			
Ref. no.	Type of area, task or activity	Ē _m Ix	UGRL -
5.26.1	Filing, copying, etc.	300	19
5.26.2	Writing, typing, reading, data processing	500	19
5.26.3	Technical drawing	750	16
5.26.4	CAD work stations	500	19

Unified glare rating



UGR: summation over all glare sources in the field of view

Average Luminance L ~ Intensity / Area

30





\$2.80 B





























How to define source area?

What about the bright points?









CIE JTC7 (D3/D1) Discomfort caused by glare from luminaires with a non-uniform source luminance





The 1st Meeting @ The 28th CIE SESSION July 2nd, 2015 Manchester, UNITED KINGDOM

> Chair: Naoya Hara (JP) Co-Chair: Yukio Akashi (JP) Secretary: Gilles Vissenberg (NL)

CIE JTC7 "Discomfort caused by glare from luminaires with a non-uniform source luminance"



1. To review the literature on glare from non-uniform light sources to identify the parameters that influence the discomfort prediction (UGR) and define limits to the applicability of the UGR formula.

2. To propose a correction to the UGR formula that takes into account the non-uniformity of glare sources.

Proposed to the Division 3 meeting in April, 2013 Approved by the BA as JTC of Divisions 3 & 1 in 10.2014

Literature review of studies on glare by non-uniform lighting fixtures



L.M. Geerdinck, C. Funke, M.C.J.M. Vissenberg, Ch. Schierz, PROCEEDINGS of the 4th CIE Expert Symposium on Colour and Visual Appearance, p. 247 CIE x043-2016

Proposed UGR Corrections

Two schools of thought

• Effective area



Take a luminance image



Blur the image based on **visual acuity** (eye resolution)



Calculate area and average luminance of the bright parts only (L>L_{threshold})

University of Leuven (Belgium), University of Ilmenau (germany) • Effective luminance



Take a luminance image

- average L_{ave}
- standard deviation σ

Calculate *effective luminance*:

 $L_{eff} = L_{ave} (1 + \sigma / L_{ave})^{0.68}$

Kansai University (Japan), Zhejiang University (China) Compare models with subjective data: determine difference in UGR ("DUGR") for uniform versus non-uniform sources



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Comparison effective area vs effective luminance

Data of Kansai University and Utsonomiya University, Japan





T. Tashiro, S. Kawanobe, T. Kimura-Minoda, S. Kohko, T. Ishikawa and M. Ayama, Lighting Res. Technol. 2015; 47, p. 316-337



HARA, N., HASEGAWA, S. (2012) Journal of Illuminating Engineering Institute Japan 96 (2), p. 81–88.





Comparison effective area vs effective luminance

Data of Zhejiang University, China





Y Yang, M Ronnier Luo, S-N Ma and X-Y Liu, Lighting Res. Technol. 2015; 49: 195-210 Y Yang, M Ronnier Luo and SN Ma, Lighting Res. Technol. 2016; 49: 727-742





Comparison effective area vs effective luminance

Data of University of Ilmenau, Germany





3rd Committee meeting, Jeju Island Korea October 27th 2017

• Decision to use effective area method



- Finalize working draft in 2017, vote in 2018
- Practical implementation:
 - Luminaire manufacturers provide photometric data
 - Photometric data contains the luminous area defined according to the effective area method (area is chosen such that correction DUGR=0)
 - UGR can then be applied (for instance in DIALUX) without changing anything!





DUGR>0

DUGR=0



Acknowledgements (JTC7)



PHILIPS Lighting

Naoya Hara Yukio Akashi Yang Yang Ronnier Luo Carsten Funke Gertjan Scheir Leonie Geerdinck Ruud Baselmans John Gielen Annette Steinbusch