

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

Gilles Vissenberg, 19 oktober 2015

CIE Div. 3 Technical Committees

Adrie de Vries
Gilles Vissenberg
Myriam Aries
Alex Rosemann

- TC 3-39: Discomfort Glare from Daylight in Buildings.** [Werner Osterhaus](#) (DK)
- TC 3-44: Lighting for Older People and People with Visual Impairment in Buildings** [Yukio Akashi](#) (JP)
- TC 3-45: Luminance Based Design Approach** [Yoshiki Nakamura](#) (JP)
- TC 3-46: Research Roadmap for Healthful Interior Lighting Applications.** [Jennifer Veitch](#) (CA)
- TC 3-47: Climate-Based Daylight Modelling** [John Mardaljevic](#) (GB)
- TC 3-48: CIE Standard Method of UF Table Calculation for Indoor Luminaires.** [Peter Thorns](#) (GB)
- TC 3-49: Decision Scheme for Lighting Controls for Tertiary Lighting in Buildings.** [Peter Dehoff](#) (AT)
- TC 3-53: Revision of CIE S 008 Joint ISO*CIE Standard: Lighting of Work Places - Part 1: Indoor** [Yasuko Koga](#) (JP)
- TC 3-54: Revision of CIE 16-1970: Daylight.** [Anna Pellegrino](#) (IT)
- TC 3-55: Metrics for Sunlighting and Daylight Passing through Sunshading Devices** [Marc Fontoynt](#) (FR)
- JTC 4 (D3/D6): Visual, Health, and Environmental Benefits of Windows in Buildings during Daylight Hours** [Martine Knoop](#) (NL)
- JTC 6 (CIE-ISO): Energy Performance of Lighting in Buildings:** [Soheil Moghtader](#) (DE)
- JTC 7 (D1/D3): Discomfort caused by glare from luminaires with a non-uniform source luminance** [Naoya Hara](#) (JP)

Agenda

- 14:15-14:20 Introductie (Gilles Vissenberg)
- 14:20-14:30 Adrie de Vries: TC 3-46 en TC 3-53
- 14:30-14:40 Myriam Aries: JTC4
- 14:40-14:50 Alexander Rosemann: JTC6
- 14:50-15:00 Gilles Vissenberg: JTC7
- 15:00-15:15 Discussie over Divisie 3 onderwerpen

CIE Division 3 update

TC3-46 & TC3-53

Adrie de Vries

Lighting Application Team - Prof. Europe

October 15, 2015

TC3-46

Research Roadmap

for Healthful Interior Lighting Applications

Research Roadmap

for Healthful Interior Lighting Applications

Intent

Create a 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 (Ocular Lighting effects on human psychology and behavior)



Research Roadmap

for Healthful Interior Lighting Applications

Content overview

Based on CIE 158:2004 (Ocular Lighting effects 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**

Research Roadmap

for Healthful Interior Lighting Applications

Current status

- Working to be submitted end of 2015
- Expected publication 2016

TC3-53

Revision of CIE S008

Lighting for indoor workplaces

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

To be used by

- All parties involved in lighting design
 - Lighting designers
 - Installers
 - Specifiers
- Governing bodies
- Certification bodies



Revision of CIE S008

Lighting of indoor workplaces

Content overview

Provides requirements and guidance for indoor lighting applications

Relevant areas

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

Requirements (currently) include

- Maintained illuminance
 - Task
 - Vertical
- Uniformity
- Direct & indirect glare
- Cylindrical illuminance

Revision of CIE S008

Lighting of indoor workplaces

Current status

- Work started mid-2013
- First rounds of committee commenting have taken place
- Possible transfer to ISO coming year



Visual, Health, and Environmental Benefits of Windows in Buildings during Daylight Hours

JTC4 | CIE Info Dag 2015 Eindhoven

Myriam Aries
i.s.m. Martine Knoop

Joint Technical Committee

- Gestart in april 2013
- JTC 4 koppelt kennis van divisie 3 en 6
 - Div 3: Interior Environment and Lighting Design
 - Div 6: Photobiology and Photochemistry



Doel

- Identificatie van de waarde van de ramen in gebouwen
 - Beoordeling wetenschappelijke literatuur alle relevante gebieden
 - Productie beknopt document
- Indien mogelijk, voorstellen voorlopige criteria voor daglichttoetredingsmetrics* om waarden te ondersteunen

** metrics zijn reeds in ontwikkeling door TC 3-47*

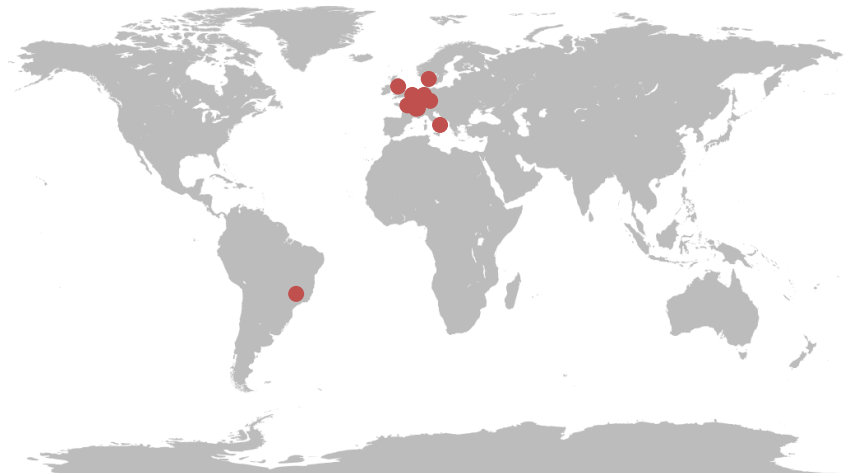
Voorbeelden waarde ramen:

- *verstrekken van licht voor zichtbaarheid,*
- *ventilatie,*
- *vluchtweg,*
- *esthetische voordelen,*
- *toegang tot uitzicht*
- *licht voor fysiologisch functioneren incluseif circadiane regeling*



Voorzitter en leden

- Voorzitter: Martine Knoop
- Maria Ámundadóttir
- Myriam Aries
- Fabio Bisegna
- John Mardaljevic
- Jitka Mohelnikova
- Mads Dines Petersen
- Luke Price
- Paolo Sergio Scarazzato





Rapport

- Inhoudsopgave

- ⊕ 1. Introduction
- ⊕ 2. Chapter 'research on windowless rooms' & 'windows are preferred'
- ⊕ 3. Functions of windows
 - ⊕ a. Daylight and individual well-being
 - ⊕ b. Daylight and architecture
 - ⊕ c. Daylight and economics
- ⊕ 4. Influence on functions of windows
- ⊕ 5. Interaction of functions of windows on benefits
- ⊕ 6. Guidelines
- ⊕ 7. Conclusions
- ⊖ 8. Further research
- ⊕ Publication bibliography



Werkwijze

- “Technical Notes”
 - Dekt een deel van het topic af
 - Sneller
 - Kleine groepen experts
- “Technical Report”
 - Combinatie van Technical Notes
 - Dekt alle topics af
 - Inclusief aanvullende details



Eerste Technical Note

- Sub-groep thema 'Individual Well-being'
- Experts:
 - Aries, M.B.C. - the Netherlands
 - Beute, F. - the Netherlands
 - Burnett, D. - United States of America
 - Hartig, T. - Sweden
 - Jahncke, H. - Sweden
 - Knoop, M. - Germany
 - Masoudinejad, S. - Iran
 - Price, L. - United Kingdom

Eerste Technical Note

HEALTH BENEFITS OF WINDOWS IN BUILDINGS DURING DAYLIGHT HOURS

DRITC D-XX

DRAFT NO. X

DATE: 2015-06-22

Date: 2015-06-22 Draft No. 0.1

the same time, results of true experiments often cannot be generalized, and real life situations might need to be validated.

Table 1 — Research focus for different types of experiments

| True experiments | Quasi-experiments | Survey studies | Ecological studies |
|-----------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------|----------------------------------------------------------|
| Windowless rooms Artificial windows, artificial views (photos, digital images) or pictures | Translucent windows with prevailing daylighting conditions Simulated 'daylight' in real application Simulated view Webcam view Arcus view Is | Seasonal changes in daylight Daylight hours View on nature / build environment | Window size, type of view, average daylight contribution |

UNDER REVIEW

...the work done with the JTC looking into scientific, health, and environmental benefits of windows in buildings health benefits of windows, for applications in which

...is a review of research on health benefits of windows found in scientific, true experiments, quasi-experiments, survey studies and ecological studies, office buildings, hospitals, responses of students, nurses, pupils and adults. Other studies are conducted in various conditions. The majority of research looks into the impact of either natural light or view.

...that, in general, research looking into the benefits of windows is conducted in three ways: experiments, survey studies and ecological studies looking into the impact of natural light should be looked at with consideration. Control of lighting conditions is often not considered or practicable. For example, research into the impact of a build versus a natural environment might have had a light contribution at the same time. Studies into daylight may be conducted in various ways (van den Berg, 2006; Beute and de

...tion: & view

...ral light (seasonal, daylight hours) (view not considered)

...t translucent windows: natural light & no view

...windowless': dynamic lighting (simulated daylight) & no view

...windowless': no natural light, no view

...Categorization of research focus, benefits of view (left) and daylight (right)

...Benefits of windows

...hers (e.g. Collins 1976; Boyce et al. 2003), the admission of daylight and the view out. Up till today, the aspects is unclear. [1] It is generally acknowledged that lighting (Heerwagen and Heerwagen 1996; Boyce et al., stress, well-being and mood. To that, it is effective in terms, due to its availability in large amounts during the

1

2



Technical Note 2 & 3

- Voorstel subgroepen:
 - Daylight and individual well-being
 - Daylight and architecture
 - Daylight and economics
- Vrijwilligers
 - Schrijven
 - Reviewen



Planning

- Meest recente versie

| Datum | Taak | |
|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| 04.2013 | Start of the Joint TC 'Visual, Health, and Environmental Benefits of Windows in Buildings during Daylight Hours' | ✓ |
| 08.2015 | Technical Note 1: review of scientific data on a number of selected aspects |  |
| 04.2016 | Technical Note 2: review of scientific data on remaining aspects |  |
| 05.2017 | Working Draft of Technical Report, including guidance on preliminary criteria for daylighting metrics (metrics from work conducted in, for example, TC 3-47, IES Daylight metrics committee and CEN WG 11) | |
| 05.2018 | Publication Technical Report | |



Vragen?

Workshop CIE Info Dag 2015
Eindhoven

Myriam Aries

Energy Performance of Lighting in Buildings

Workshop at CIE Info Dag 2015
Eindhoven

Adrie de Vries, Alex Rosemann

New JTC

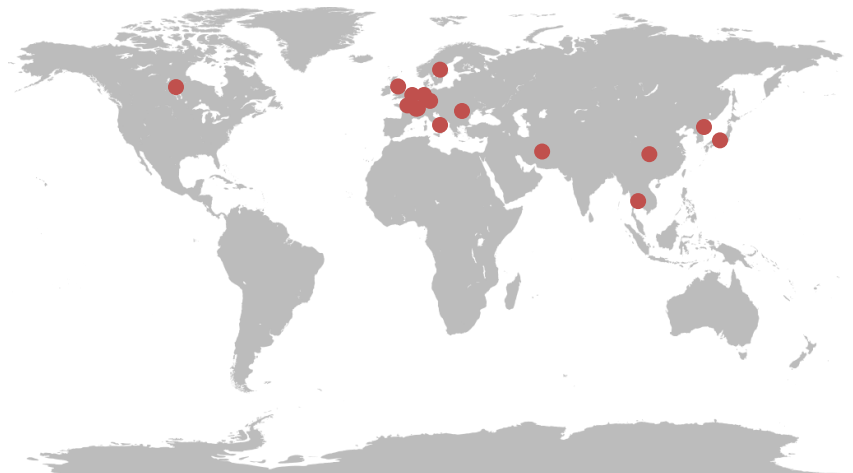
- CIE TC 3-52 Energy Performance of Buildings – Energy Requirements for Lighting disbanded
 - (former) Task: monitoring CEN & ISO work
- Joint Technical Committee (JTC) established:
 - JTC 6 Energy Performance of Lighting in Buildings
 - CIE Div 3 and ISO TC 274 (light and lighting)
 - Convenour Soh el Moghtader (DE)

Membership

- Convenor: Moghtader, Sohéil

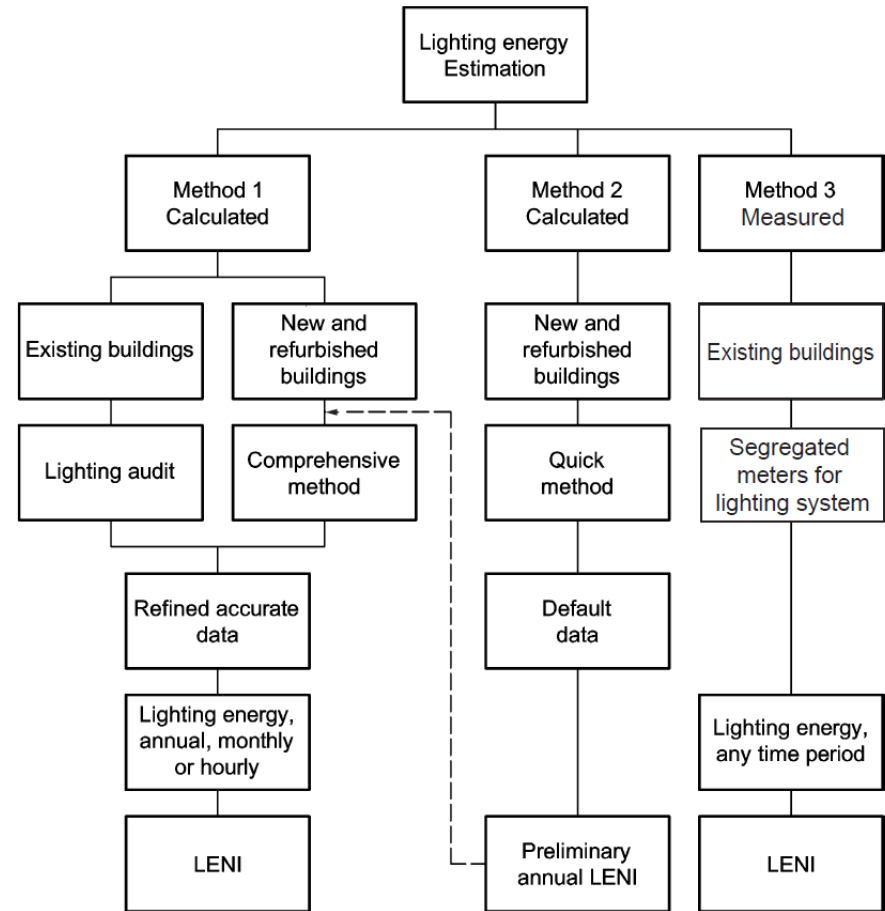
- Experts:

- | | | | |
|--------------------------|-------------|------------------------------|-------------|
| – Beu, Dorin | (RO) | – Rauwerdink, Kay | (NL) |
| – Choi, An Seop | (KR) | – Rosemann, Alexander | (NL) |
| – Cornelius, Wolfgang | (DE) | – Schrader, Björn | (CH) |
| – Coursière, Nathalie | (FR) | – Thorns, Peter | (UK) |
| – Daams, Job | (NL) | – Tuaycharoen, Nuanwan | (THA) |
| – de Boer, Jan | (DE) | – WANG, Shuxiao | (CN) |
| – de Vries, Adrie | (NL) | – ZHANG, Wei | (CN) |
| – Dehoff, Peter | (AU) | | |
| – Gasparovsky, Dionyz | (SK) | | |
| – Govén, Tommy | (S) | | |
| – Kirsch, Raphael | (DE) | | |
| – Lau, Toby | (CAN) | | |
| – Miki, Yasuhiro | (J) | | |
| – Minnerup, Jörg | (DE) | | |
| – Moslehi, Hamid | (IR) | | |
| – Pagano, Fabio | (IT) | | |
| – Rahmatian, Zahra | (IR) | | |



Goal

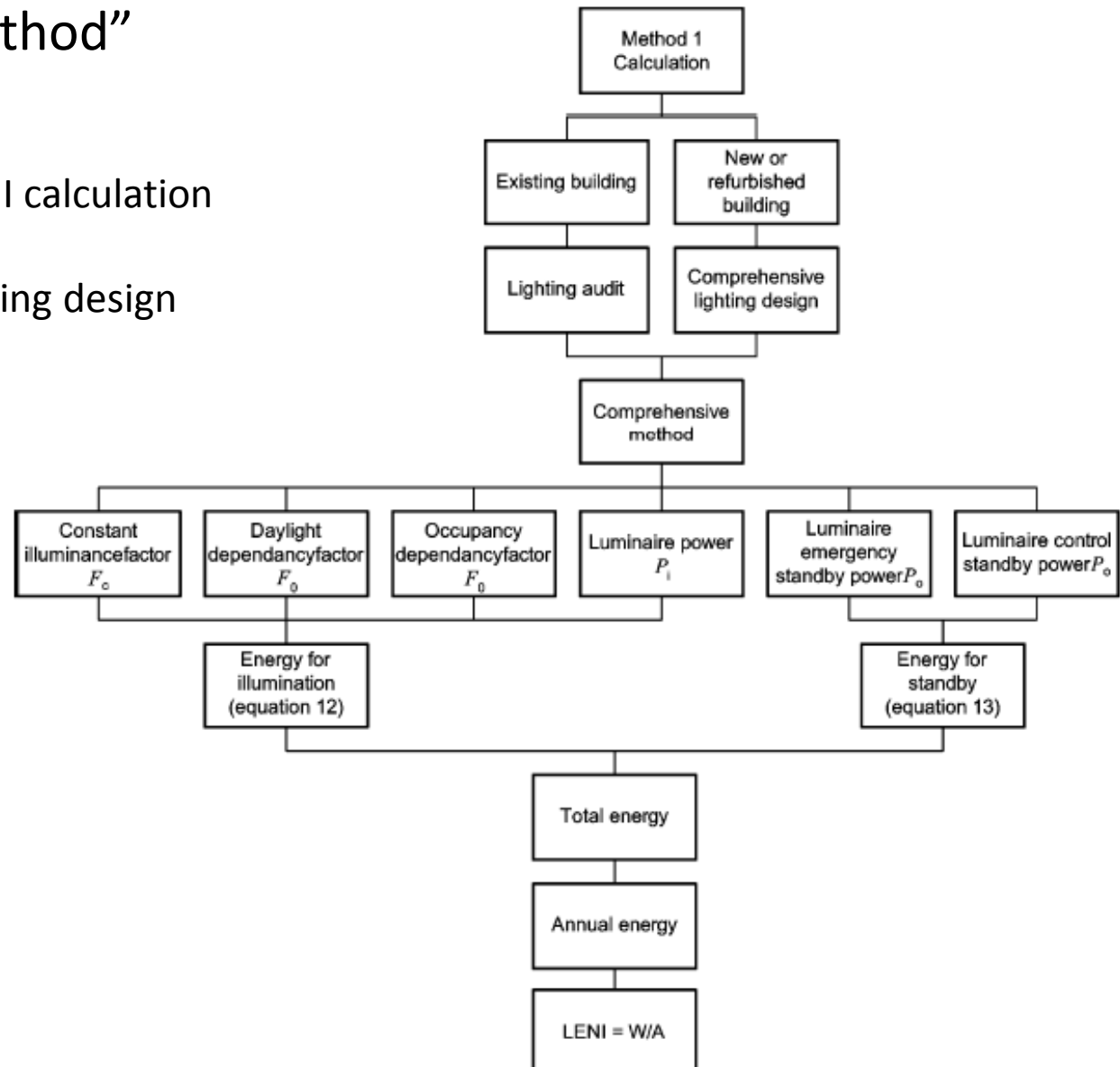
- Develop an ISO Standard, describing the methodology to determine the energy consumption for lighting in a building
- Starting point: (new) EN15193-1
- Alignment with ISO 10916 “Calculation of the impact of daylight utilization on the net and final energy demand for lighting”



Method 1

“comprehensive method”

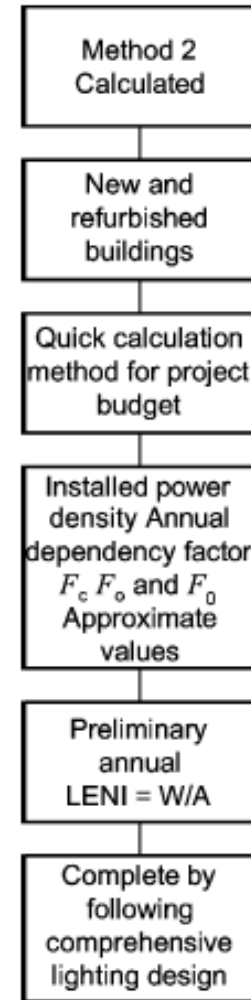
- Intended for ‘final’ LENI calculation
- Based on detailed lighting design



Method 2

“quick method”

- Intended for ‘budget’ calculation and/or first building permits.
- Very rough calculation method to reach an indication of LENI




Progress

- 2015-02: Call for Experts
- 2015-06: Meeting in Manchester
- 2015-09: Webmeeting

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

Next Steps

- Next Meeting in November in Eindhoven



JTC7

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

CIE info dag
TUE Eindhoven
19 oktober 2015

Gilles.Vissenberg@philips.com

Discomfort glare in indoor applications

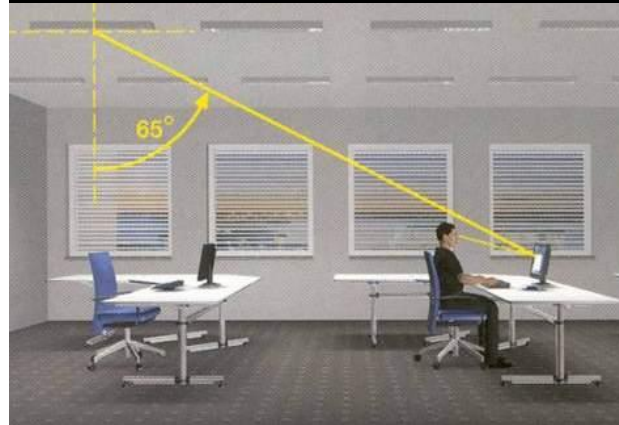
Direct glare



$$UGR = 8 \log \frac{0.25}{L_b} \sum \frac{L^2 \Omega}{p^2}$$

Unified glare rating
UGR < 19 for office tasks in
most countries

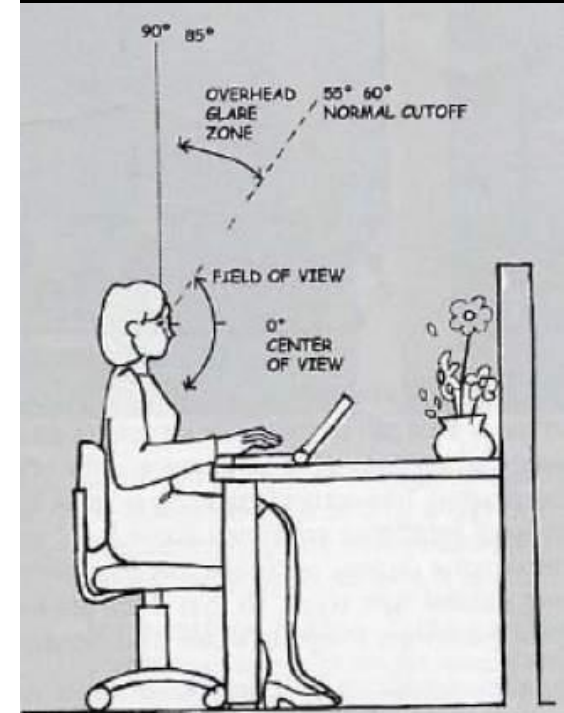
Indirect glare



Limiting values for luminance
or intensity at large angles to
the vertical direction

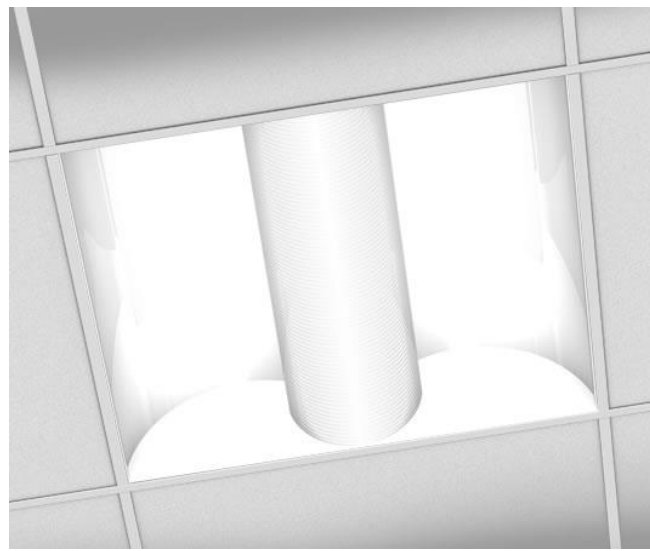
EN12464-1:
 $L(65) < 1500 \text{ cd/m}^2$

Overhead glare



Limiting value at angles
outside field of view
Recommendation
ANSI IESNA RP-1-12
 $L < 8000 \text{ cd/m}^2$

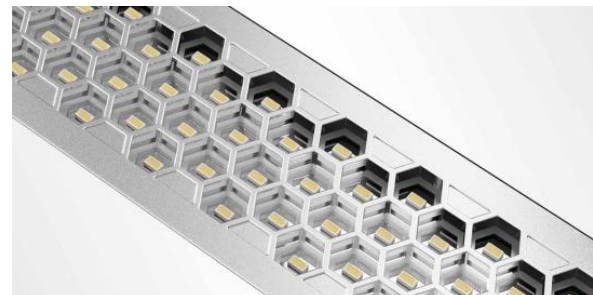
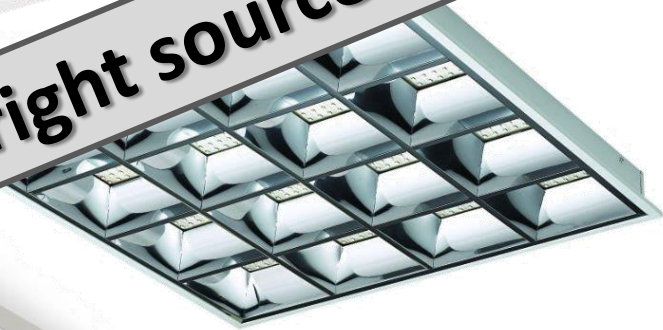
All norms and recommendations relate to *average* luminance



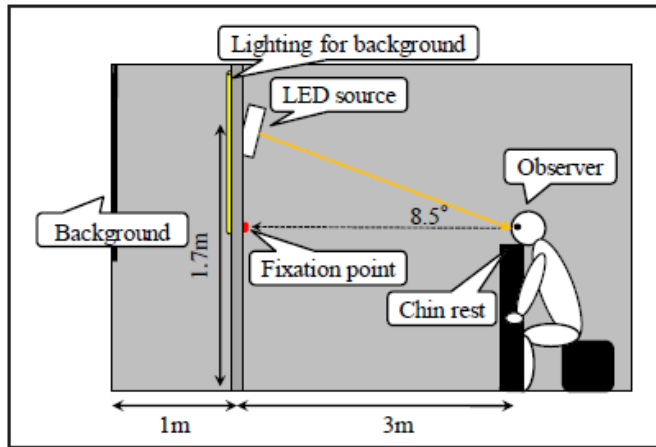
What area may be counted as luminous exit window?



What is the impact of small bright sources ?



Increasing number of studies on glare by non-uniform lighting fixtures



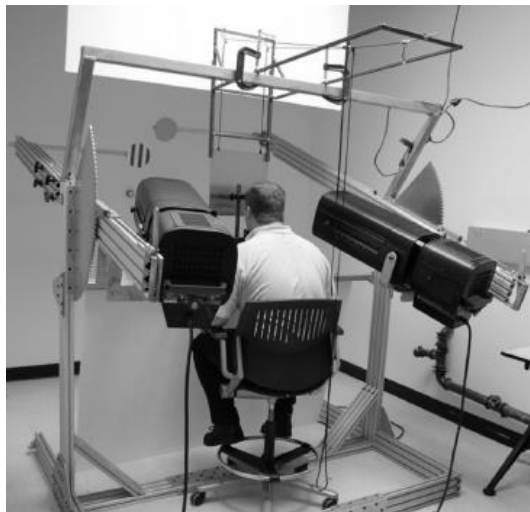
M. Ayama et al. CIE 2013



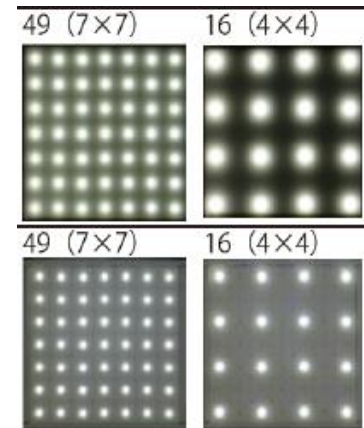
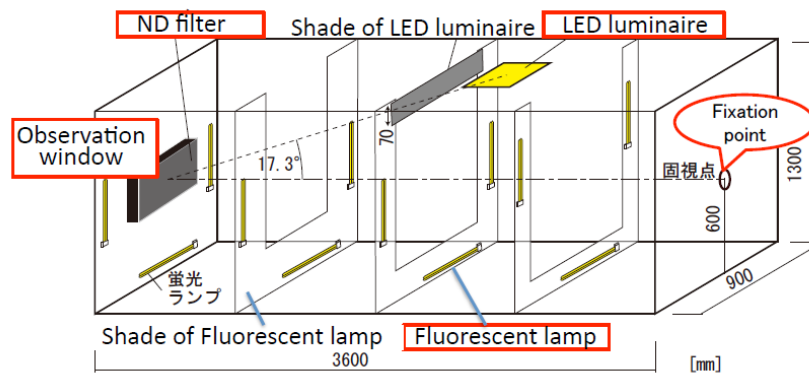
H. Higashi et al. CIE 2013



N. Miller et al. 2013



Eble-Hankins 2008

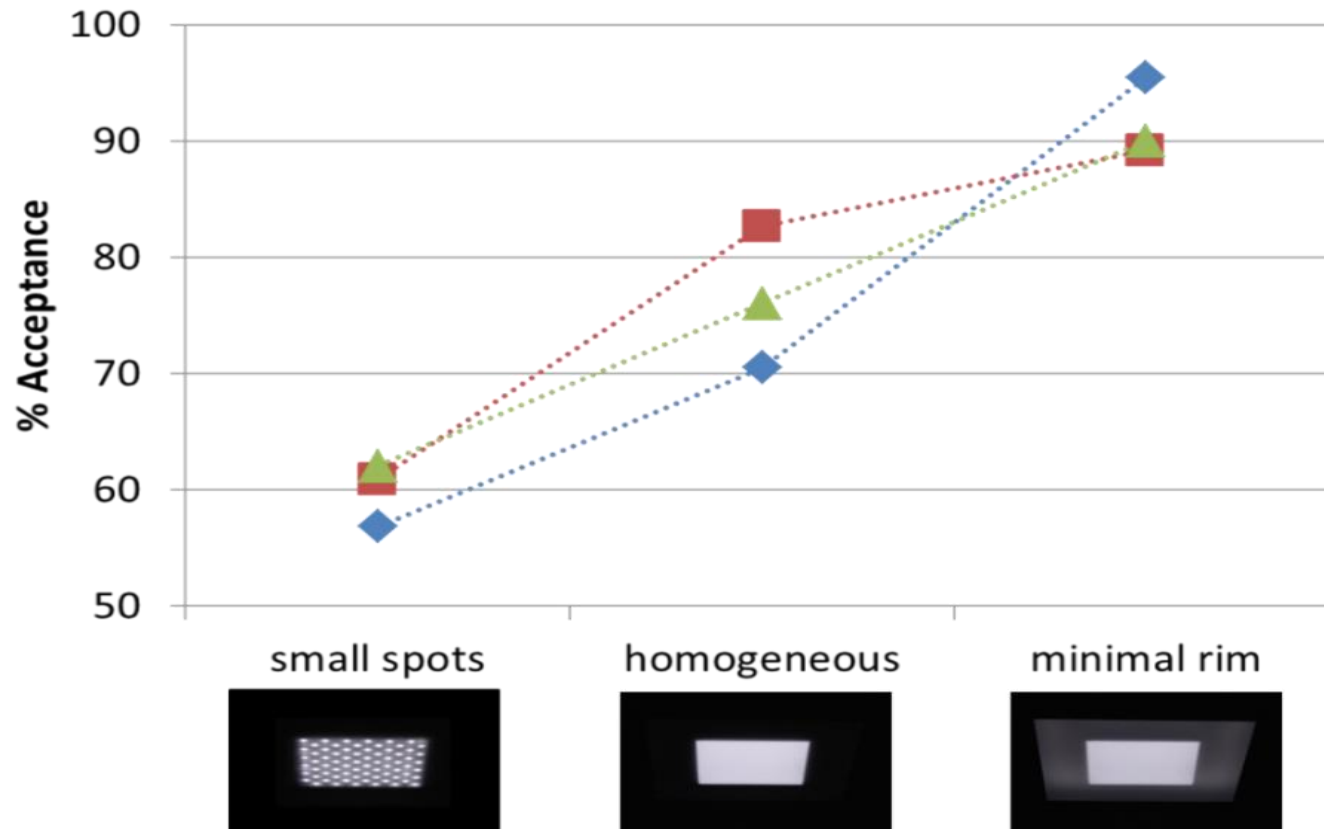


N. Hara and S. Hasegawa 2012

Philips Research studies on glare by non-uniform luminaires



◆ Eindhoven (NL) ■ Briarcliff (US) ▲ Shanghai (CN)



Evidence is accumulating... something needs to be done

Discomfort glare ratings can be applied when the maximum luminaire luminance to average luminaire luminance ratio is less than 5:1

(based on *P. Boyce, "Human factors in Lighting" (2003)*)

"... large arrays of LEDs... appear to be more glaring in some arrangements and luminaires than in others ..."

(*T. Mc Gowan – R3-24 CIE Division 3*)

"A new glare evaluation system is needed as the present systems have been developed for circumstances different from LED lighting"

(*M. Knoop et al. CIE 205:2013 Review of Lighting Quality Measures for Interior Lighting with LED Lighting Systems*)

"the existing formulae of UGR, CGI, BGI, and VCP... are inappropriate for evaluating non-uniform electric light sources"

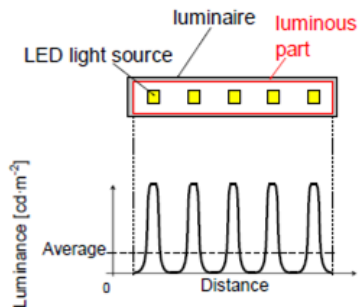
(*H. Cai and T. Chung, LRT (2012)*)

"UGR method might not be able to apply the prediction of discomfort glare in LED lighting"

(*H. Higashi et al. CIE 2013*)

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



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

TC Members

| | | | |
|---------------------|---------------------|------------------------------------------------------|-----|
| Chair, (Div 3) | Naoya Hara | Kansai University | JP |
| Co-Chair (Div 1) | Miyoshi Ayama | Utsunomiya University | JP |
| Secretary | Gilles Vissenberg | Philips Lighting | NL |
| Member | Carsten Funke | Technische Universität Ilmenau | DE |
| | Chien-Yue Chen | National Yunlin University of Science and Technology | TWN |
| | Christoph Schierz | Technische Universität Ilmenau | DE |
| | Etsuko Mochizuki | Chiba Institute of Technology | JP |
| | Gertjan Scheir | KU Leuven | BE |
| | Hirokuni Higashi | Toshiba Lighting and Technology corporation | JP |
| | Martine Knoop | Technische Universität Berlin | DE |
| | Naomi Miller | Pacific Northwest National Laboratory | US |
| | Nuanwan Tuaychareon | Kasetsart University | TH |
| | R, Luo | Leeds University | UK |
| | Sheng, Peng | Philips Research China | CN |
| | Yi-Chun Chen | National Central University | TWN |
| | Yoshiki Nakamura | Tokyo Institute of Technology | JP |
| | Urszula BLASZCZAK | Bialystok University of Technology | PL |
| | Kevin Poulton | | AU |
| Günther HASNA | OPTIS GmbH | DE | |

July. 2015—1st TC meeting
(physical at Manchester CIE Session, with via WebEx)

Dec. 2015 --Relevant literature compiled
Limiting parameters identified, establish limits
to UGR, decide whether intermediate report will
be issued or not.

Mar. 2016---2nd TC meeting at the CIE Conference

July. 2016 --Intermediate report (CIE Technical Note)
completed, if any

Jan. 2017 -- First Working Draft ballot in TC

Apr. 2017 --WD delivered to CIE Central Bureau
(Later steps as per Code of Procedure)

