SLOVENSKO DRUŠTVO ZA RAZSVETLJAVO / SDR
LIGHTING ENGINEERING SOCIETY OF SLOVENIA

“New challenges in lighting”

Marc Fontoynont,

National Engineering School of State Public Works,
Vaulx-en-Velin, Lyon, France

ENTPE

CNRS

Statements:

« Lighting is a technique to help human activities: read, work, sell, circulate, clean, repair, etc. in security, and, if possible, in an agreeable way. »

« But the lighting community is aware of limits (cost and energy) and concerned by possible impacts on human health of exposure to light »

Two international initiatives:

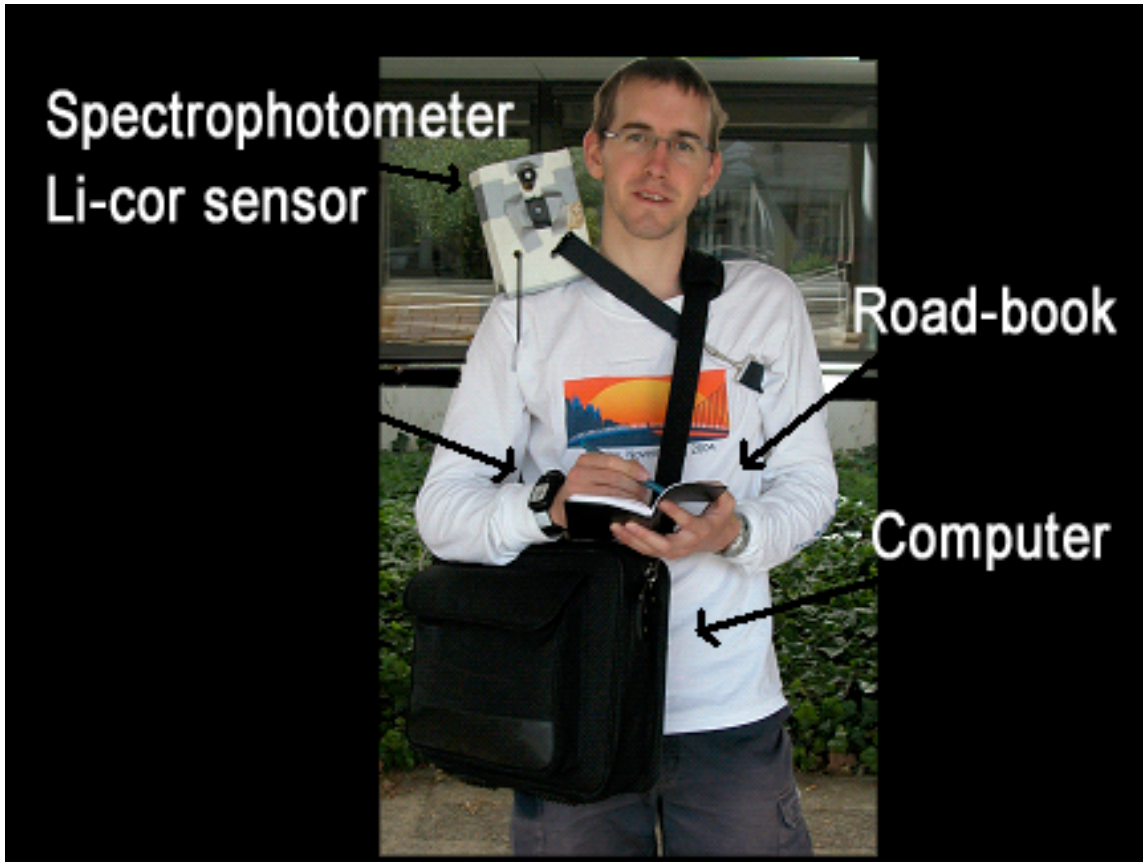
Annex 45 « Energy Efficient Lighting
of the International Energy Agency

International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

Light and Health Symposium,
Ottawa, Canada,
September 7-8 . 2006

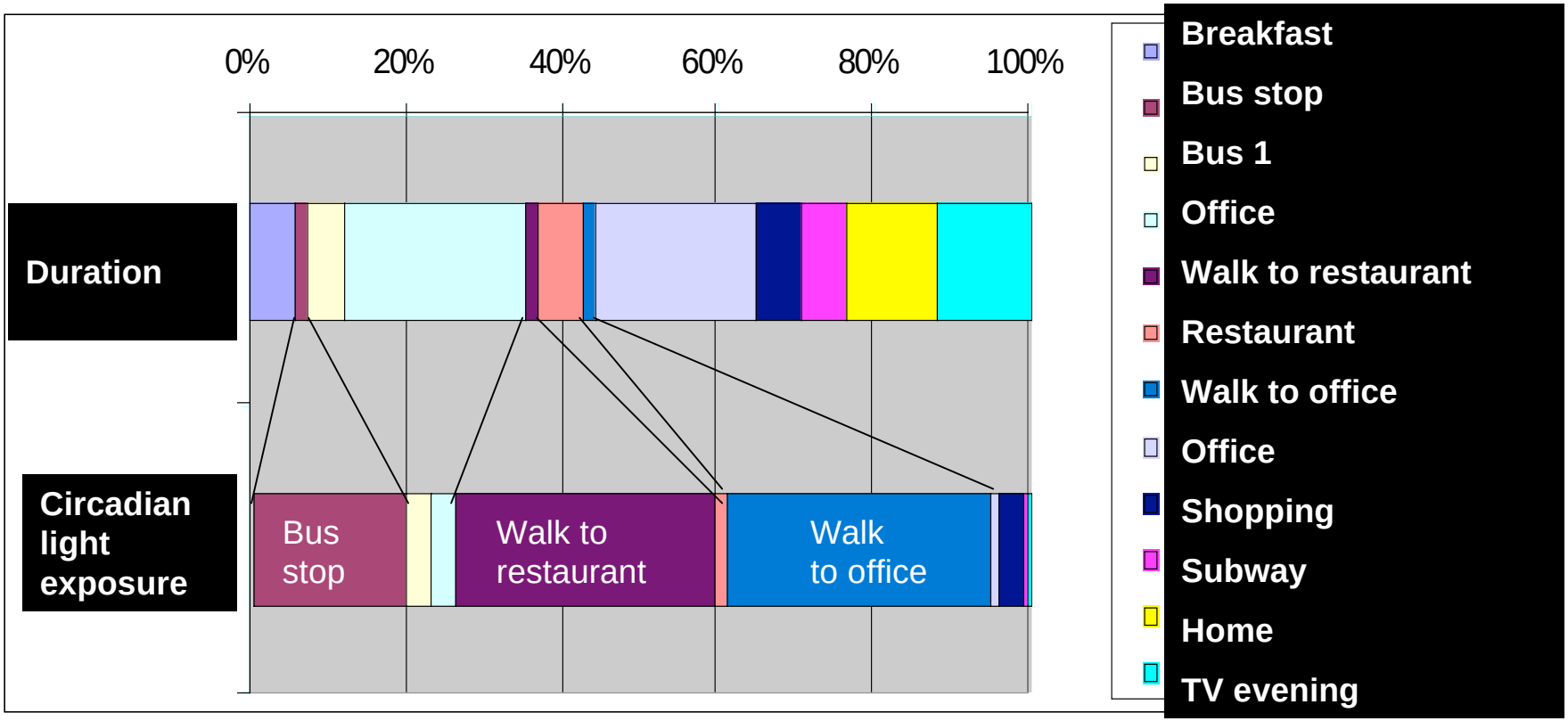
Commission Internationale de l'Eclairage,

Production of a spectral data base of typical exposure to light during springdays



Source: Nollet, H. (2006)
« Lumière & Santé : Quelles sont les doses reçues durant la journée ? Production d'une base de données par profils d'activité. » Ms Degree, 2006, ENTPE, Lyon, France

Measurement of daily exposure received by an office worker in Lyon city centre during a day in May, 2006.



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« Lumière & Santé : Quelles sont les doses reçues durant la journée ? Production d'une base de données par profils d'activité. »
(Production of a spectral data base of typical exposure to light during springdays , in Lyon, France)

Attempt of summary of the symposium.

Lamp safety (UV exposure, high luminance point sources, flicker) (CIE lamp safety standards S009) *See CIE Division 6*	No more a general issue for UV for most lamps. What if MH and LEDs lamps are more widely used? May we generate new risks through increase of blue light use?
Vocabulary, metrics, standards, action spectrum, etc.	Urgently needed!
Lighting during the day for populations deprived from sufficient daylight exposure (latitude, season, windowless environments)	Effect of spectrum identified, Technology available (high CCT lamps, LEDs) The dose still needs to be defined, as well as optimal duration and occurence.

Ederly population	Blue rich light benefits Compensate yellowing of lens Address higher glare sensitivity Improve lighting quality
Lighting of night-shift workers	Possible high consequences, requires global approach (day/night strategy). Difficult balance between objectives of alertness and health protection. Lighting specifications still unclear at night-time.
Substitution of medicine through light exposure	Sleeping pills (melatonine, …) Healing, Vitamin D supplements, Analgesic ?
General issue: acceptability of blue rich light?	Appropriate lighting design and luminaries. Need field testing

Commission Internationale de l'Eclairage

Annual Meeting of CIE Division 3 - Interior Lighting

Saturday, September 9. 2006
Lord Elgin Hotel
Room Lady Elgin
Time 9:00 till 16:00

Division 3 Board:

Division Director	Dr. Marc Fontoynont
Associate Director Daylighting:	Dr. Dominique Dumortier
Associate Director Elec. Lighting:	Dr. Yoshiki Nakamura
Division Secretary	Dr Geoffrey Cook

Review of on-going work, progress, liaison with other institutions, establishment of new activities: reportership and technical committee

Actions decided:

Division 6 (Photobiology) will prepare summaries concerning nightshift workers, sleep disorders, effect of jet-lag, and a proposal of vocabulary to describe the « non visual effects » of light for the 2007 CIE Session (Bejing, China, July 2007)

Division 3 will launch in the 2007 Session activities to propose recommandations in lighting to the problems identified above.

Division 3 will prepare a proposal of text concerning visually impaired population , based on recent documens prepared in the USA and the U.K. To be presented i for the next CIE session.

Division 3 will prepare, with the International Energy Agency (IEA) a joint statement concerning possiblities to reduce energy efficiency in lighting.

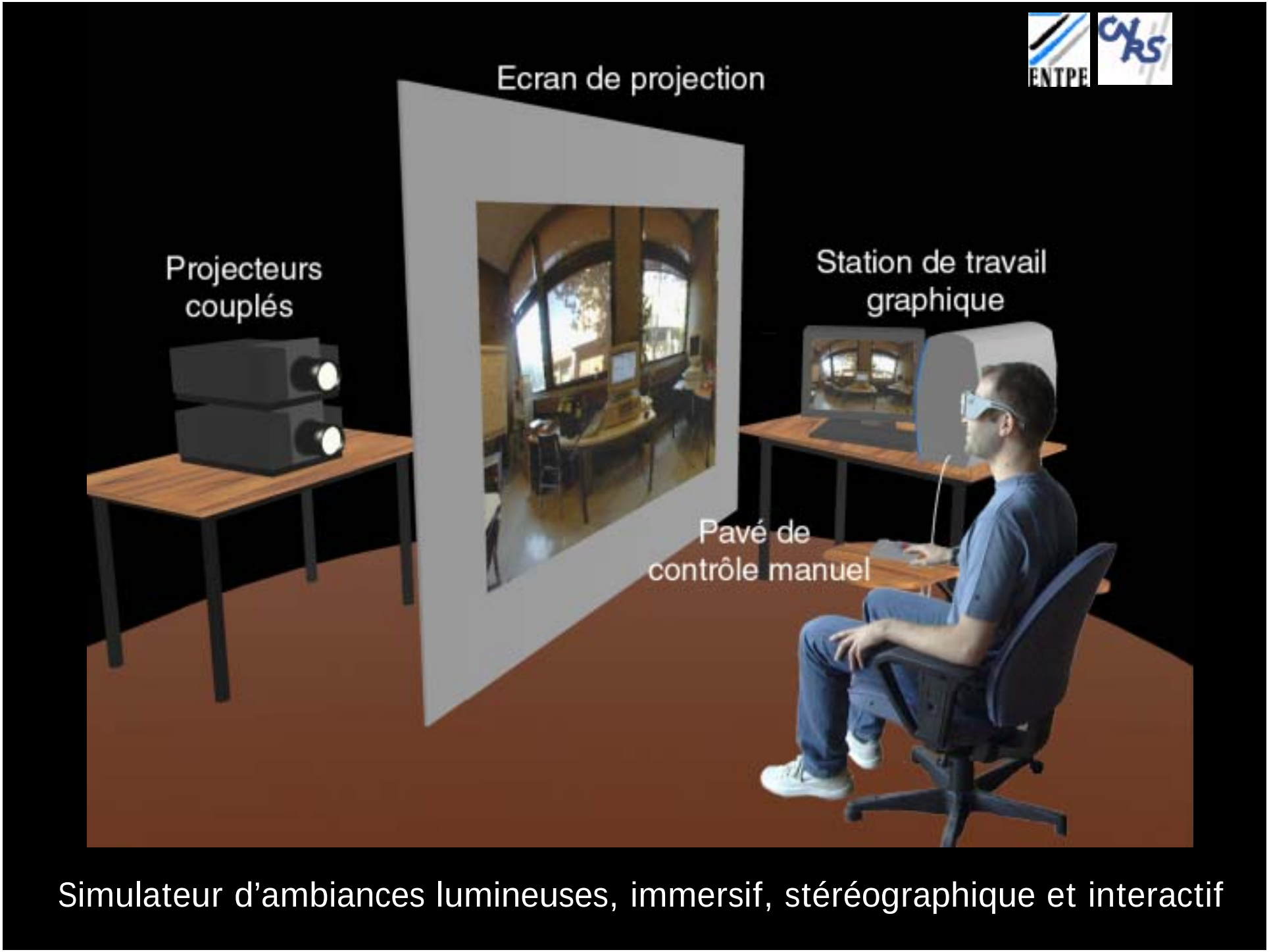

130 cd/m2
130 cd/m2
400 lux
50 personnes
de 30 à 50 ans


65 cd/m2
50 cd/m2
300 lux


140 Cd/m2
140 Cd/m2
560 lux

Twin cell experimentation (Catherine Laurentin,1997-2001)

Role of season on preferred illuminances
(+200lx, 6 subjects, 6 months, every 15 days, 15:00)
Role of colour of glass on preferred illuminances (26 subjects)
Role of air temperature (20 subjects) *No influence*
Role of distance to window *(No perfect substition of daylight by electric light at 3 m from window, 20 subject)*



Simulateur d’ambiances lumineuses, immersif, stéréographique et interactif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Conception: Ingélux/ENTPE

Twin class rooms

Simulation of daylight on both sides

Simulation of Daylight Guidance systems

Optimization of electric lighting installation

Experimentation in Groupama Headquarters, Lyon.

6 work places tested by 20 users prior to installation of 1100 work places.

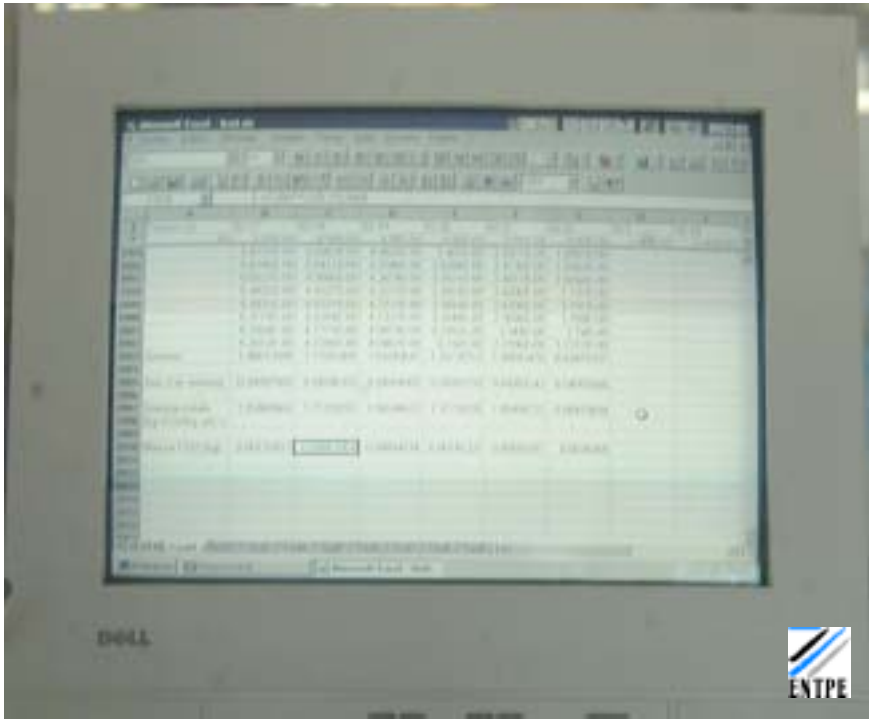
Total suppression of vision of fluorescent tubes in all directions

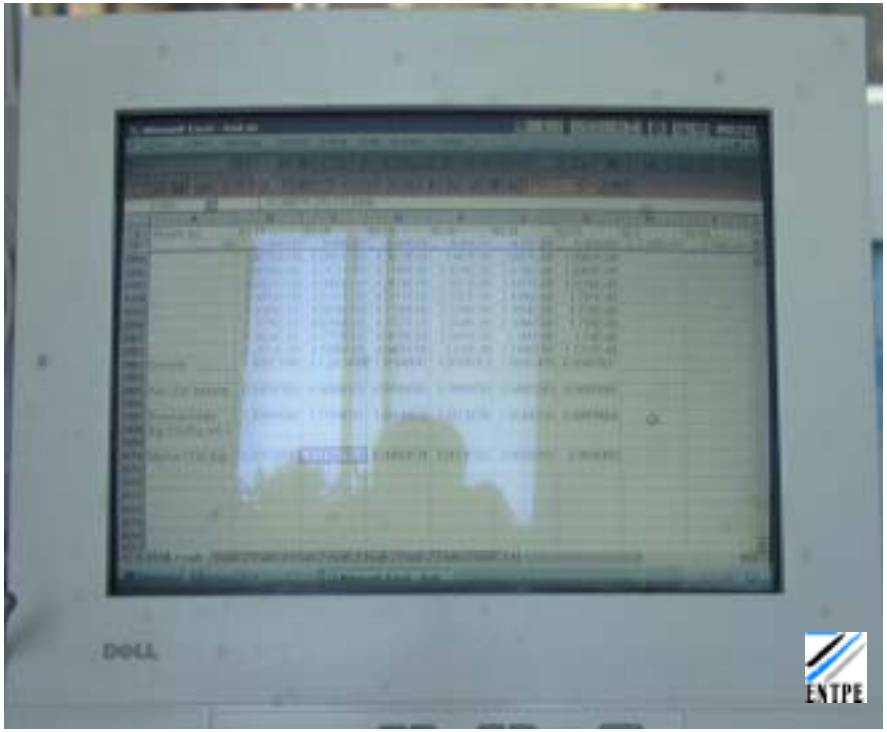
Direct indirect luminaires.

Individual control

Installed power < 8W/m2

Shading device design:
luminance maintained below 3000 cd/m2 for all weather conditions





Analysis of overhead glare

Caroline Thoreau, Dominique Dumortier, 2006.

Relative position of luminaire
Maximum luminance

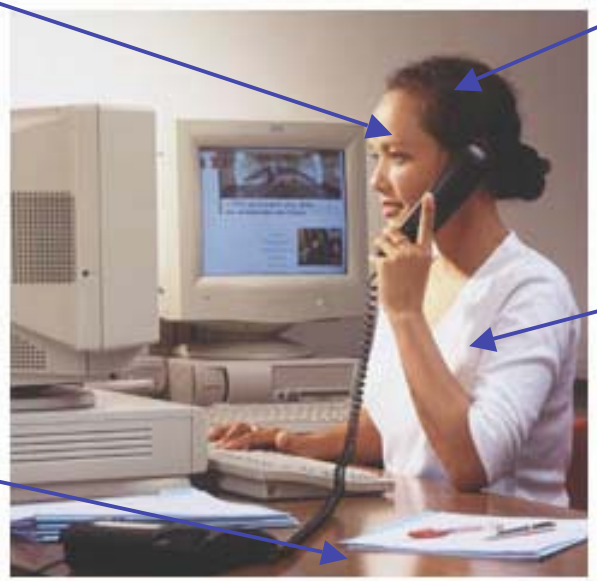
Vertical illuminance at eye level

Glasses

Shape of face (morphology)

Skin colour

Illuminance on head



Reflexion of light on clothing

Coefficient of reflexion on work plane

Age of the observer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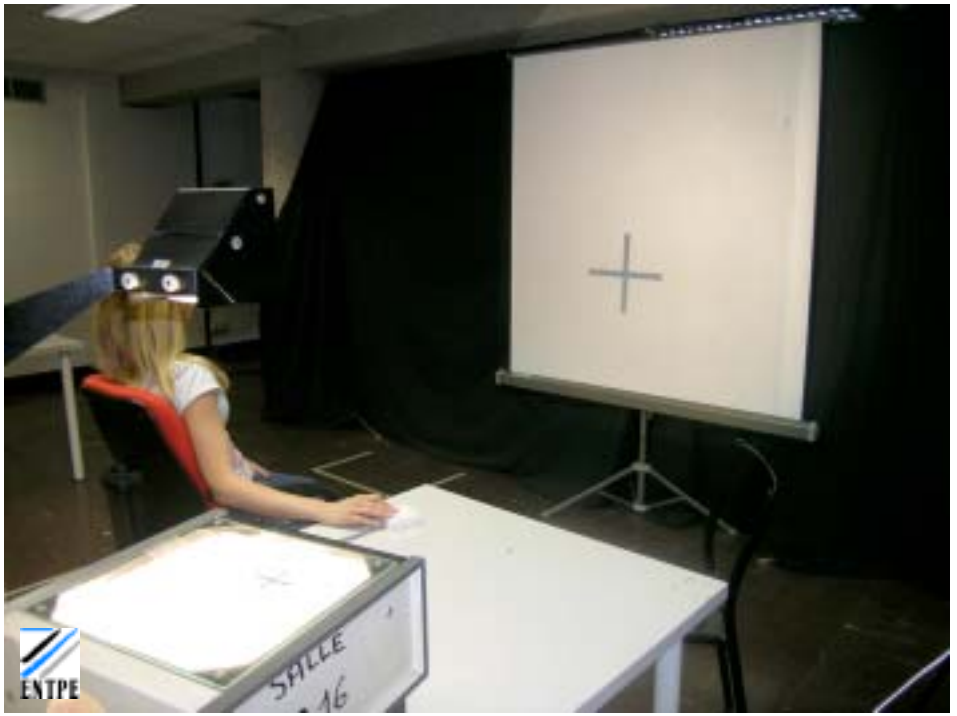
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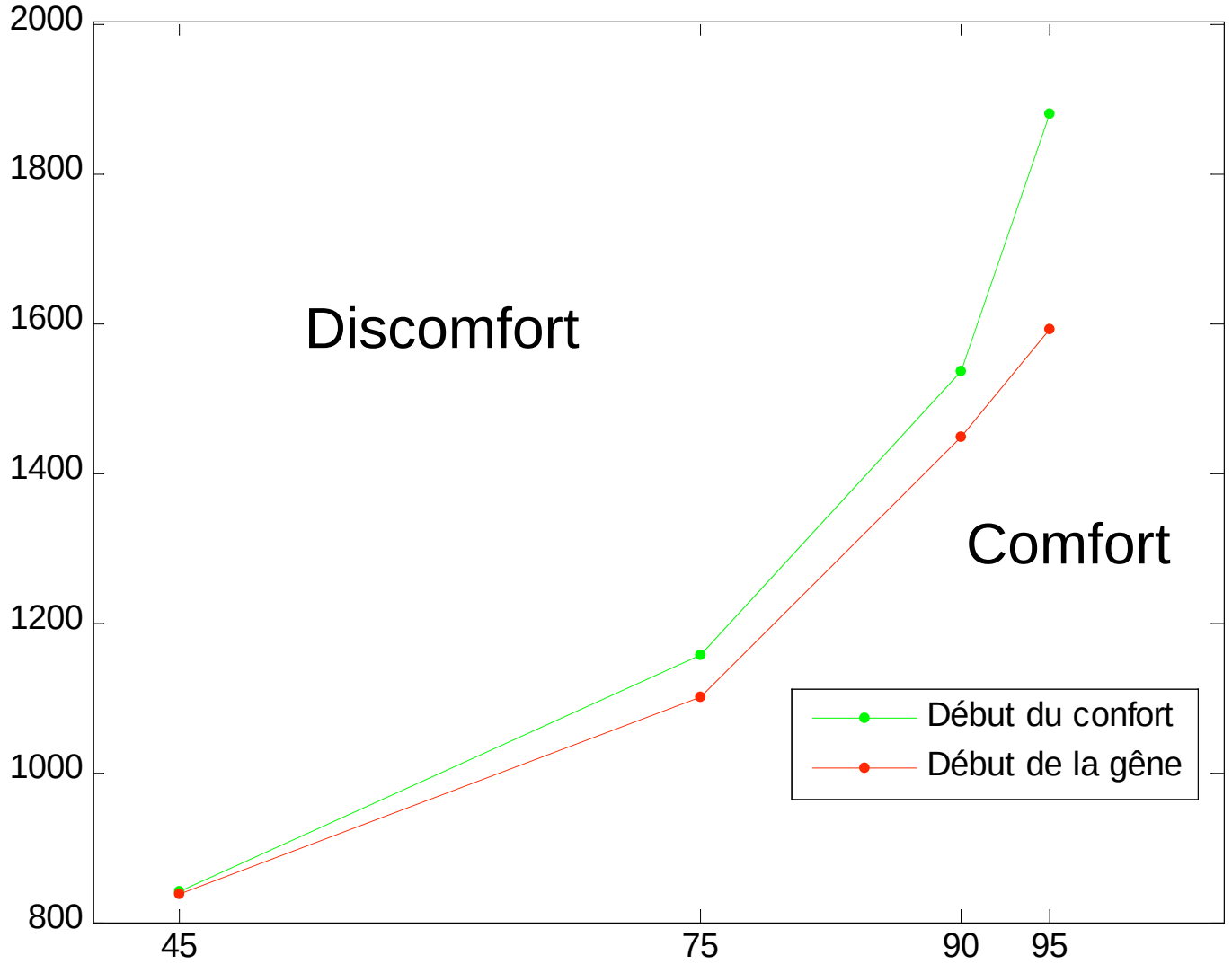
Horizontal illuminance



Relative position of luminaire (angle of vision)

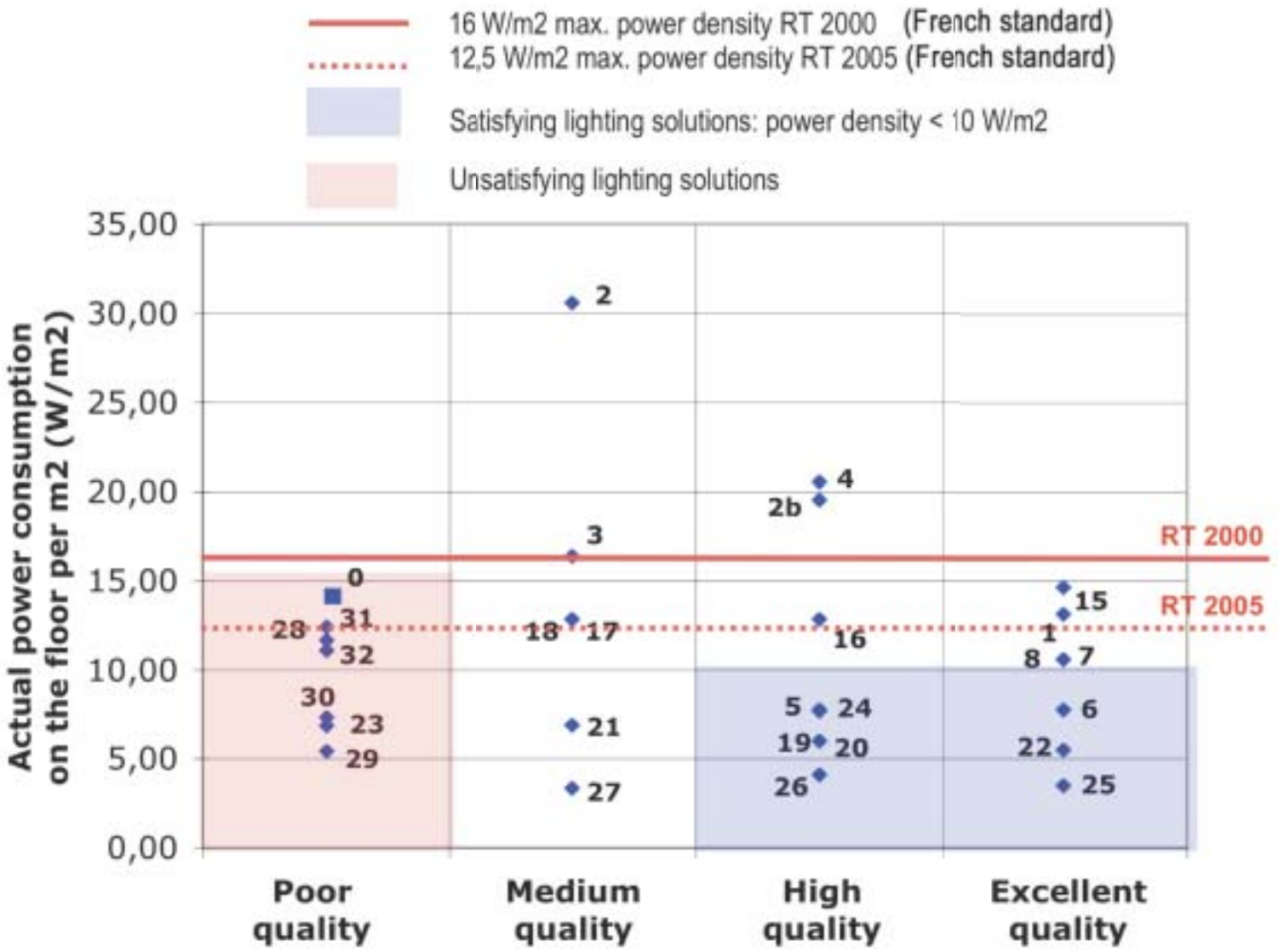
Influence of light reflexion on skin

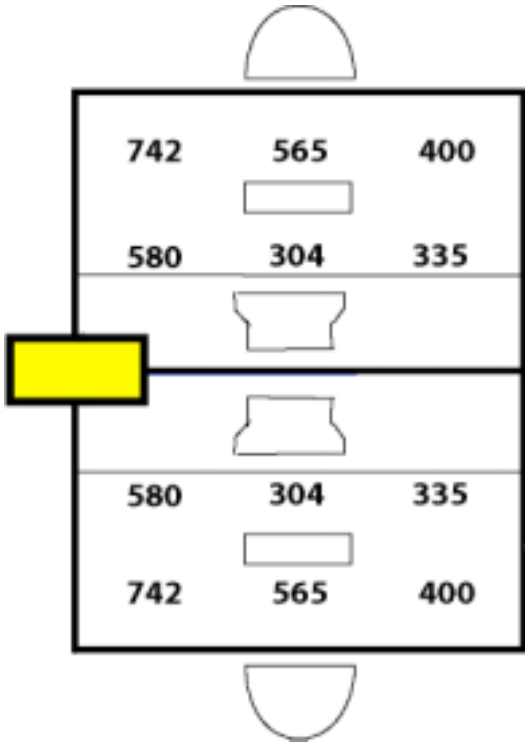
	Début confort (lux)	Début gêne (lux)
Sans fard	***1534***	***1465***
Avec fard	***2213***	***1896***
Différence	***679***	***431***
Seuil significatif	***600***	***400***

Office building, Lyon, France. 32 work places tested during 5 months

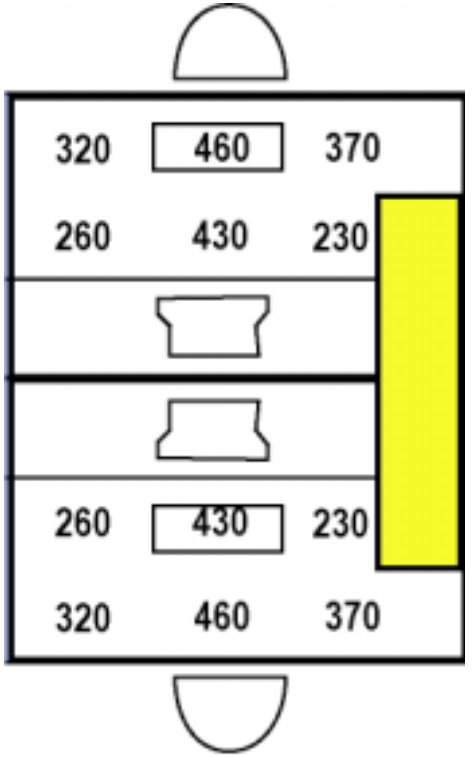
International Energy Agency
Energy Conservation in Buildings and Community Systems Programme

Ingélux, ENTPE

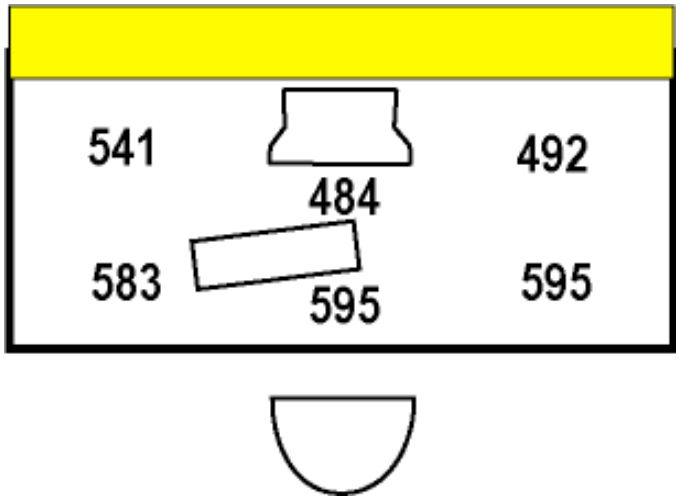

16 W/m2 max. power density RT 2000 (French standard)
12,5 W/m2 max. power density RT 2005 (French standard)
Satisfying lighting solutions: power density < 10 W/m2
Unsatisfying lighting solutions
Actual power consumption on the floor per m2 (W/m2)
35,00
30,00
25,00
20,00
15,00
10,00
5,00
0,00
RT 2000
RT 2005
0
31
28
32
30
23
29
2
3
18
17
21
27
4
2b
5
24
19
20
26
16
15
1
8
7
6
22
25
Poor quality
Medium quality
High quality
Excellent quality



Direct-indirect stand alone luminaire. Its independence with the ceiling allow to locate the luminaire very precisely near the work space. The users appreciated the dimming option associated to the daylighting-occupancy sensor. Can be shared with another occupant. Considered as high standing. Typically 100W per work space required, less than 8W/m^2 in open plan office. Typical light sources about 2 CFL 55W per occupant, partly dimmed.



Direct-indirect suspended luminaire. Allow usage of 1.20 or 1.50m fluorescent tube. But work place cannot move if luminaire position is fixed. Leads to the lowest electrical consumption: 6W/m^2. In open plan office. Could use 2x54 W fluorescent tubes for two people.



Indirect luminaire integrated to the furniture. Juged as very comfortable, the ceiling luminances are moderate, but the general feeling tends to have a work plane looking darker that the rest of the room. Requires about 2x35 W fluorescent tubes per work place.

Specifications folowing experimentation

•Hide sources so that the maximum luminance of the luminaire, in all direction is below 7000 cd/m^2.

•Reduce uniformity on work plane to a value between 0.6 and 0.8 to provide a feeling of contrast while avoiding shadows.

•Allow individual control (dimming) so that the user get the exact illuminance he/she wishes.

•Select equipment with good optical performance.

•Prefer single fluorescent tube to compact fluorescent lamps to lower electric power requirement.

•Share luminaries between work places: best performance are obtained with one luminaire providing light for two workplaces.

Indoor lighting evolution:
Progressive substitution
of halogen lamps in shops by HID, HCI lamps,
More controls of fluorescent lamps (occupancy, daylight)

Outdoor lighting evolution:
Better colour rendering index, smaller sources, longer life.

And arrival of LED lights

for low power applications

PrimaVision Xtreme
CosmoPolis

OSRAM POWERBALL® HCI®
OSRAM POWERSTAR® HCI®

OSRAM

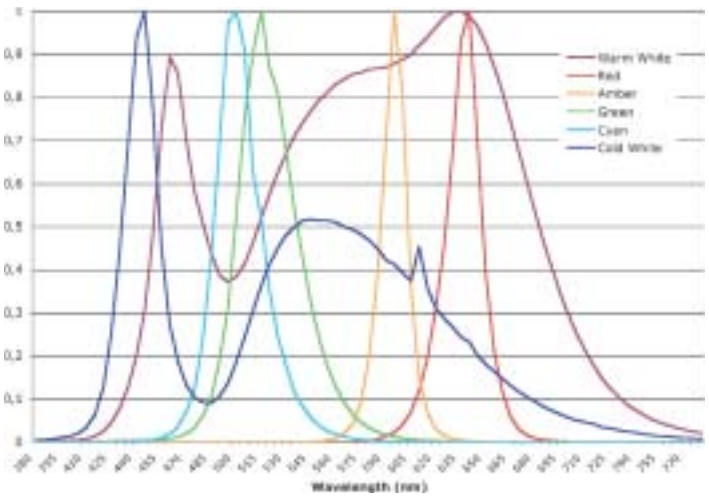
Equinox

PHILIPS


ENTPE


ENTPE

Optimization of colour Mixing



ENTPE PHILIPS

Warm White

Cool White + Amber

Color mixing , focusing, framing, individual control of LED, temperature control.

Monna Lisa Led Spotlight by SKLAER Lighting, Germany,

Design: Fraen (Itaie), ENTPE (France), Russian Automotive University (Russia), Optileds (USA)
Tests: ENTPE (France), Ingélux (France)