

Energy by design: Lighting

CIBSE East Midlands Region

3rd December 2013

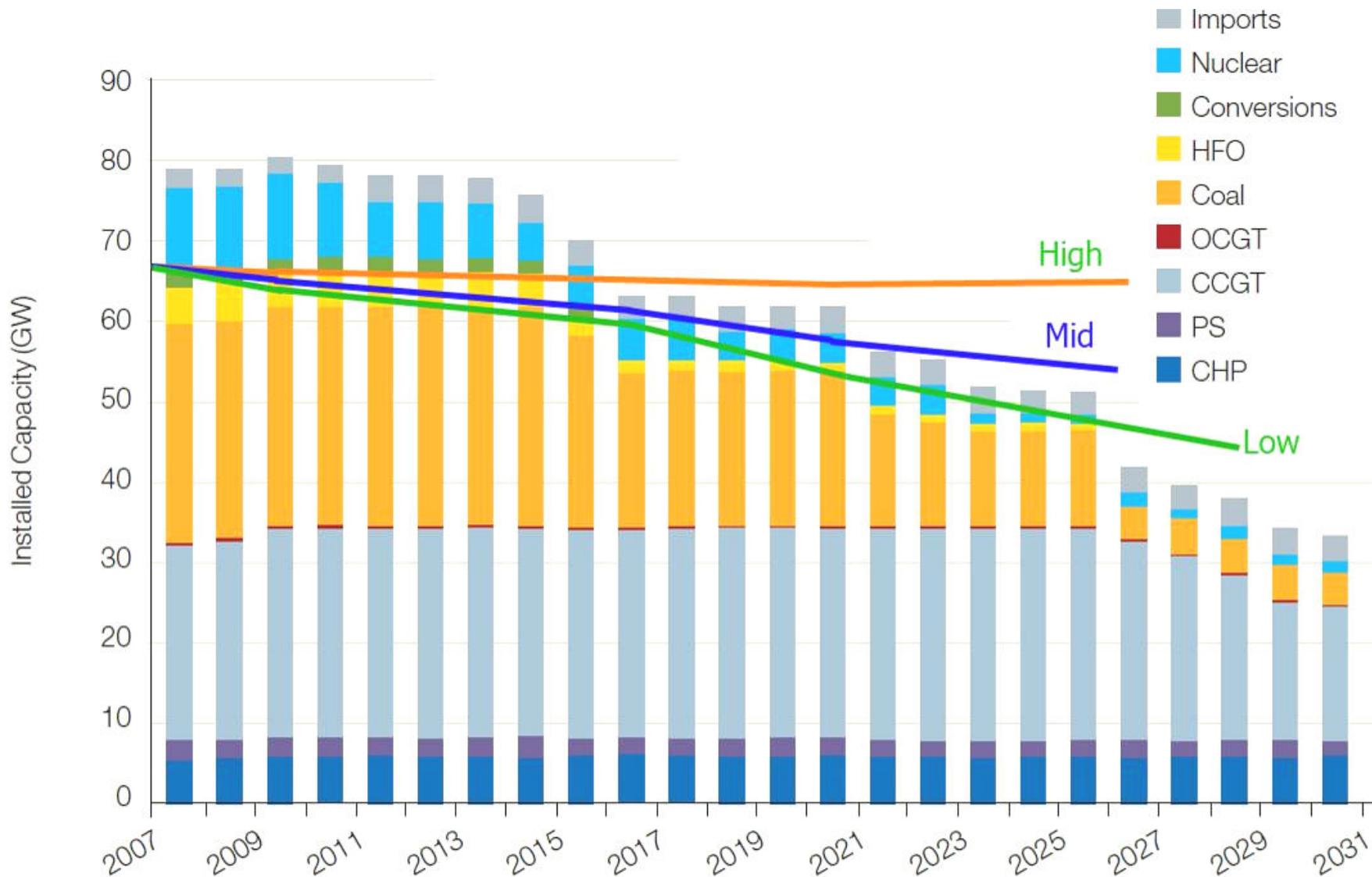
Liz Peck MSc FSL



- Energy challenges
- Part L update
- Lighting for people
- Objectives & considerations
- Lighting palettes
- Getting it right

- Energy Efficiency





Source: Pöyry Energy Consulting

- 80% reduction in CO₂ by 2050
- 66% of 2050 building stock already exists
- 26 million buildings exist today
- 18 million will need refurbishment
- 500,000 every year

50 buildings an hour

LPA

LIGHTING

Carbon Reduction Commitment

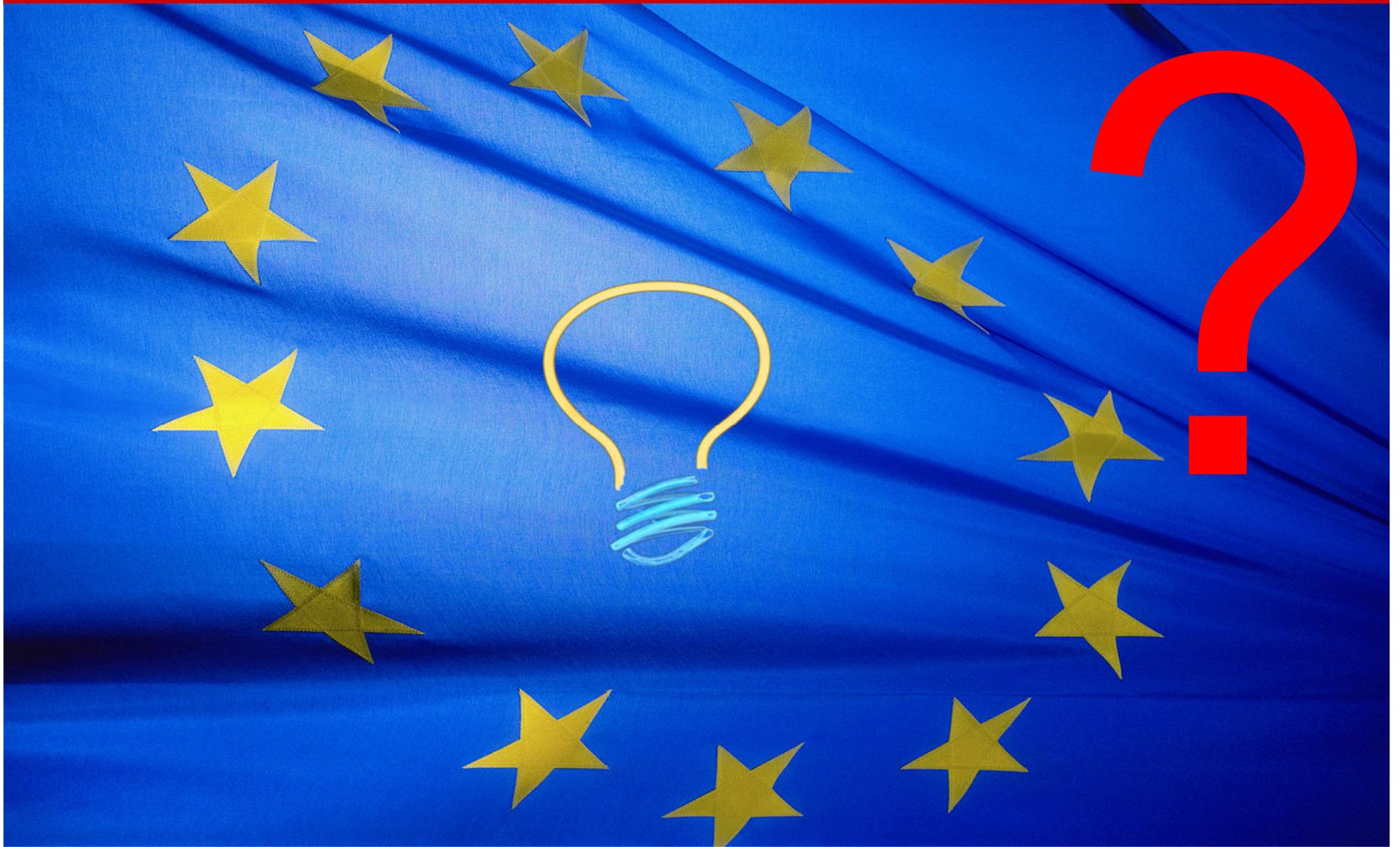




Seeking a cure for the human condition

- Payback – Return on Investment
- Incentives
 - ECA
- Loans
 - Carbon Trust
 - Energy Saving Trust





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Regulation

ONLINE VERSION
HM Government

The Building Regulations 2010

Conservation of fuel and power **L1A**
APPROVED DOCUMENT

L1A Conservation of fuel and power in new dwellings

2013 edition – for use in England*
ONLINE VERSION

ONLINE VERSION
HM Government

Domestic Building Services Compliance Guide

2013 edition – for use in England*
ONLINE VERSION

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HM Government

The Building Regulations 2010

Conservation of fuel and power **L2A**
APPROVED DOCUMENT

L2A Conservation of fuel and power in new buildings other than dwellings

2013 edition – for use in England*
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ONLINE VERSION
HM Government

Non-domestic Building Services Compliance Guide

2013 edition – for use in England*
ONLINE VERSION

ONLINE VERSION
HM Government

The Building Regulations 2010

Amendments to the Approved Documents

This document contains amendments to the following Approved Documents:
Approved Document L1B: Conservation of fuel and power in existing dwellings (2010 edition)
Approved Document L2B: Conservation of fuel and power in existing buildings other than dwellings (2010 edition)

November 2013

For use in England*
ONLINE VERSION

HM Government

The Building Regulations 2010

Amendments to the Approved Documents

This document contains amendments to the following Approved Documents:
A, B vol 1, B vol 2, C, D, E, F, G, H, J, L1A, L1B, L2A, L2B and M

2013

For use in England*



- Part L 2013/4

- Domestic: 6% change

- Non-domestic: 9% change

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LIGHTING



Regulation



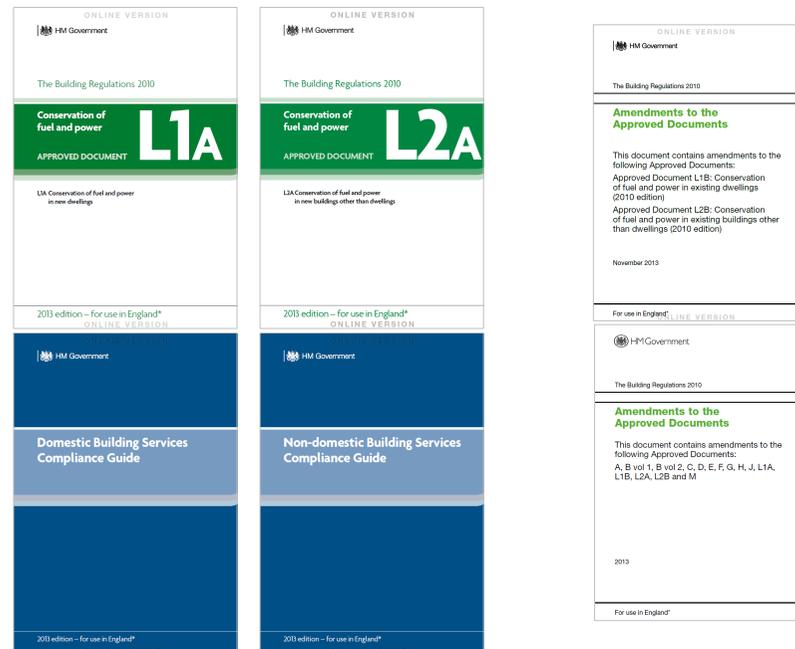
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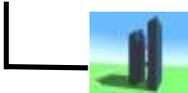
LIGHTING



Regulation

- ! SBEM assumes full control !
- Backstop: 60 LL/W
- Controls options
- LENI



	Potential Reduction	
Manual on/off	0%	<i>No lighting controls</i>
 Daylight - controls  penetration improvements  Absence detection  Time management	20- 40% 20% 15-30% 5-15%	<i>With lighting controls</i>

Courtesy: Lou Bedocs

Table 42 Recommended minimum lighting efficacy with controls in new and existing buildings

		Initial luminaire lumens/circuit-watt
General lighting in office, industrial and storage spaces		60
Controls	Control factor	Reduced luminaire lumens/circuit-watt
a daylit space with photo-switching with or without override	0.90	54
b daylit space with photo-switching and dimming with or without override	0.85	51
c unoccupied space with auto on and off	0.90	54
d unoccupied space with manual on and auto off	0.85	51
e space not daylit, dimmed for constant illuminance	0.90	54
a + c	0.80	48
a + d	0.75	45
b + c	0.75	45
b + d	0.70	42
e + c	0.80	48
e + d	0.75	45
General lighting in other types of space		The average initial efficacy should be not less than 60 lamp lumens per circuit-watt
Display lighting		The average initial efficacy should be not less than 22 lamp lumens per circuit-watt

- Installed power
- Standby power
- Daylight contribution
- Occupancy patterns
- Operating hours
- Lighting controls

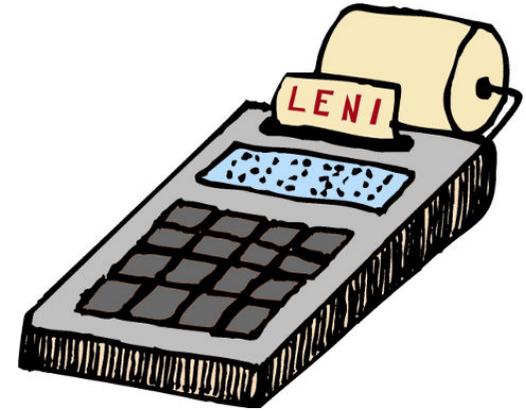
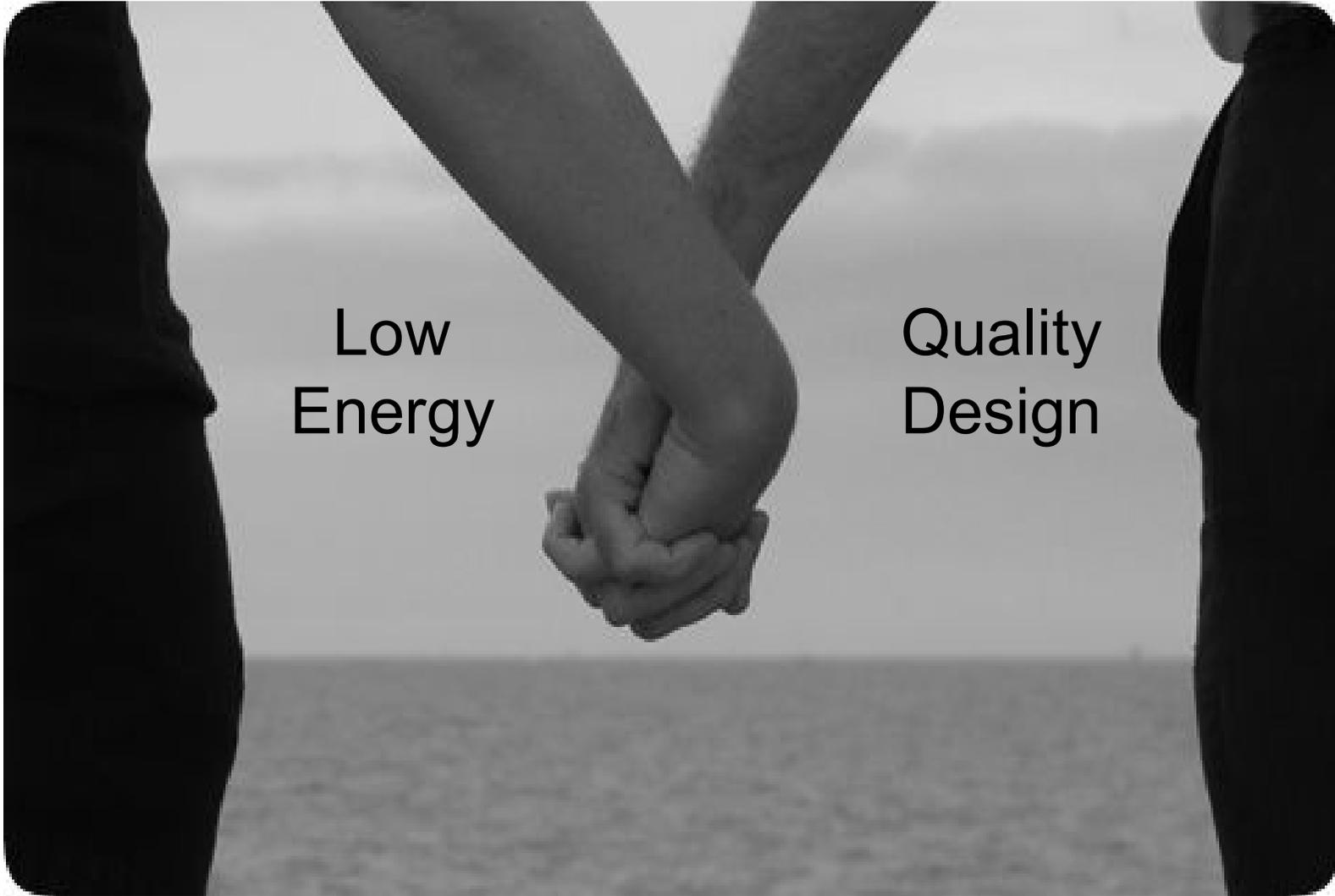


Table 44 Recommended maximum lighting energy consumption (kWh) per sqm per year in new and existing buildings (lighting energy limit)

Hours			Illuminance (lux)								Display Lighting	
Total	Day	Night	50	100	150	200	300	500	750	1000	Normal	Shop window
1000	821	179	1.11	1.92	2.73	3.54	5.17	8.41	12.47	16.52	10.00	
1500	1277	223	1.66	2.87	4.07	5.28	7.70	12.53	18.57	24.62	15.00	
2000	1726	274	2.21	3.81	5.42	7.03	10.24	16.67	24.70	32.73	20.00	
2500	2164	336	2.76	4.76	6.77	8.78	12.79	20.82	30.86	40.89	25.00	
3000	2585	415	3.31	5.72	8.13	10.54	15.37	25.01	37.06	49.12	30.00	
3700	3133	567	4.09	7.08	10.06	13.04	19.01	30.95	45.87	60.78	37.00	
4400	3621	779	4.89	8.46	12.02	15.59	22.73	37.00	54.84	72.68	44.00	96.80
5400	4184	1216	6.05	10.47	14.90	19.33	28.18	45.89	68.03	90.17	54.00	
6400	4547	1853	7.24	12.57	17.89	23.22	33.87	55.16	81.79	108.41	64.00	
8760	4380	4380	10.26	17.89	25.53	33.16	48.43	78.96	117.12	155.29	87.60	192.72





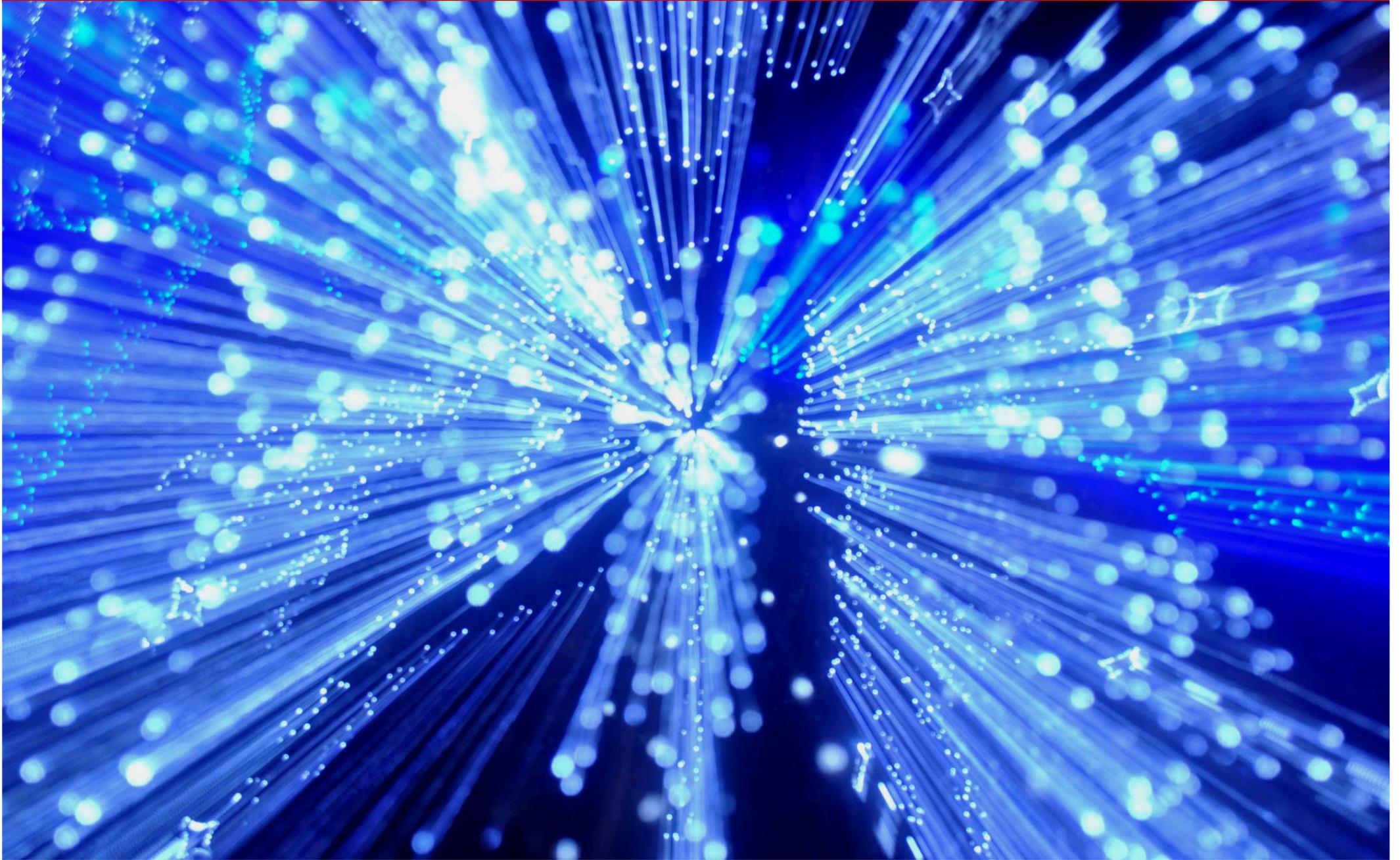


Low
Energy

Quality
Design

Lighting Design... the oldest
profession in the world!

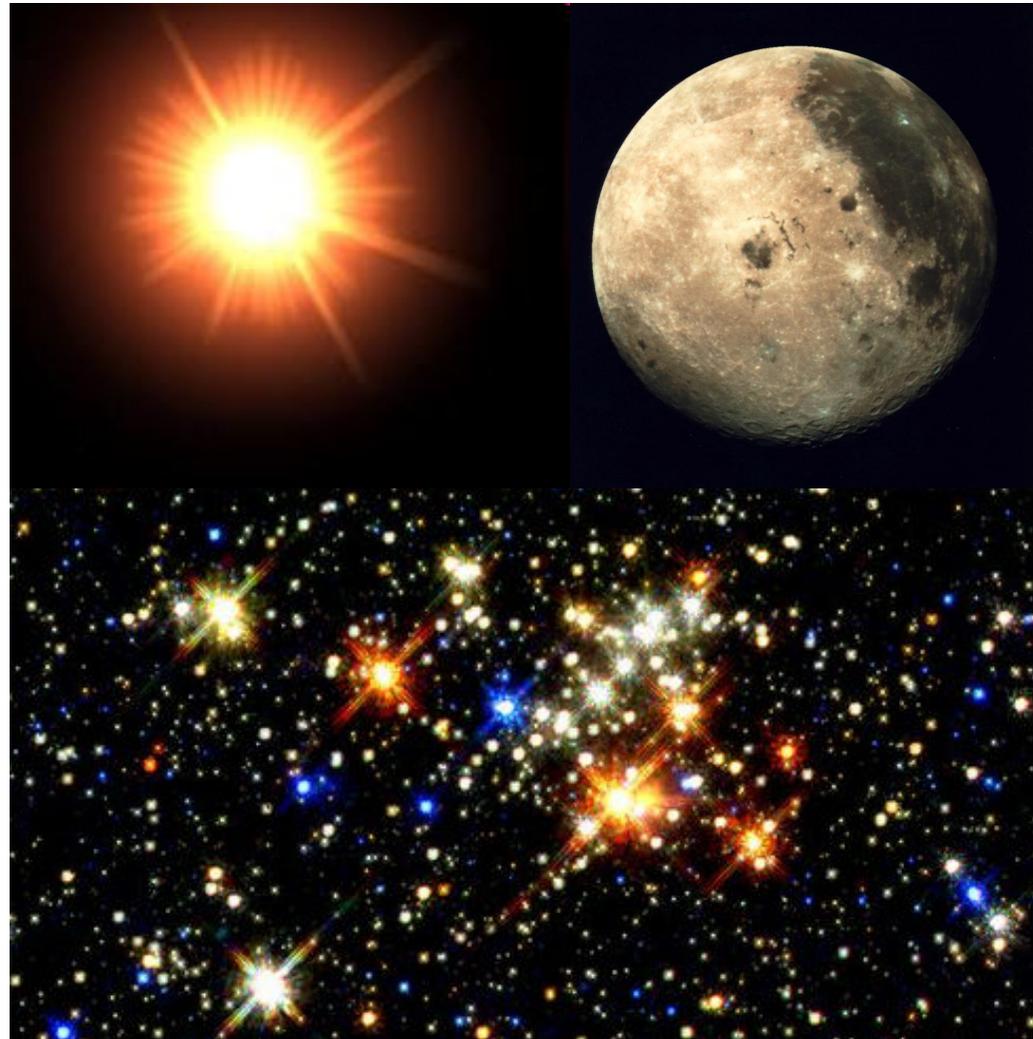




LPA

LIGHTING









Lit effect



Luminaires & controls



People



People



Lit effect



Luminaires & controls





*The right light
in the right place
at the right time*

LPA

LIGHTING

Who

What



When

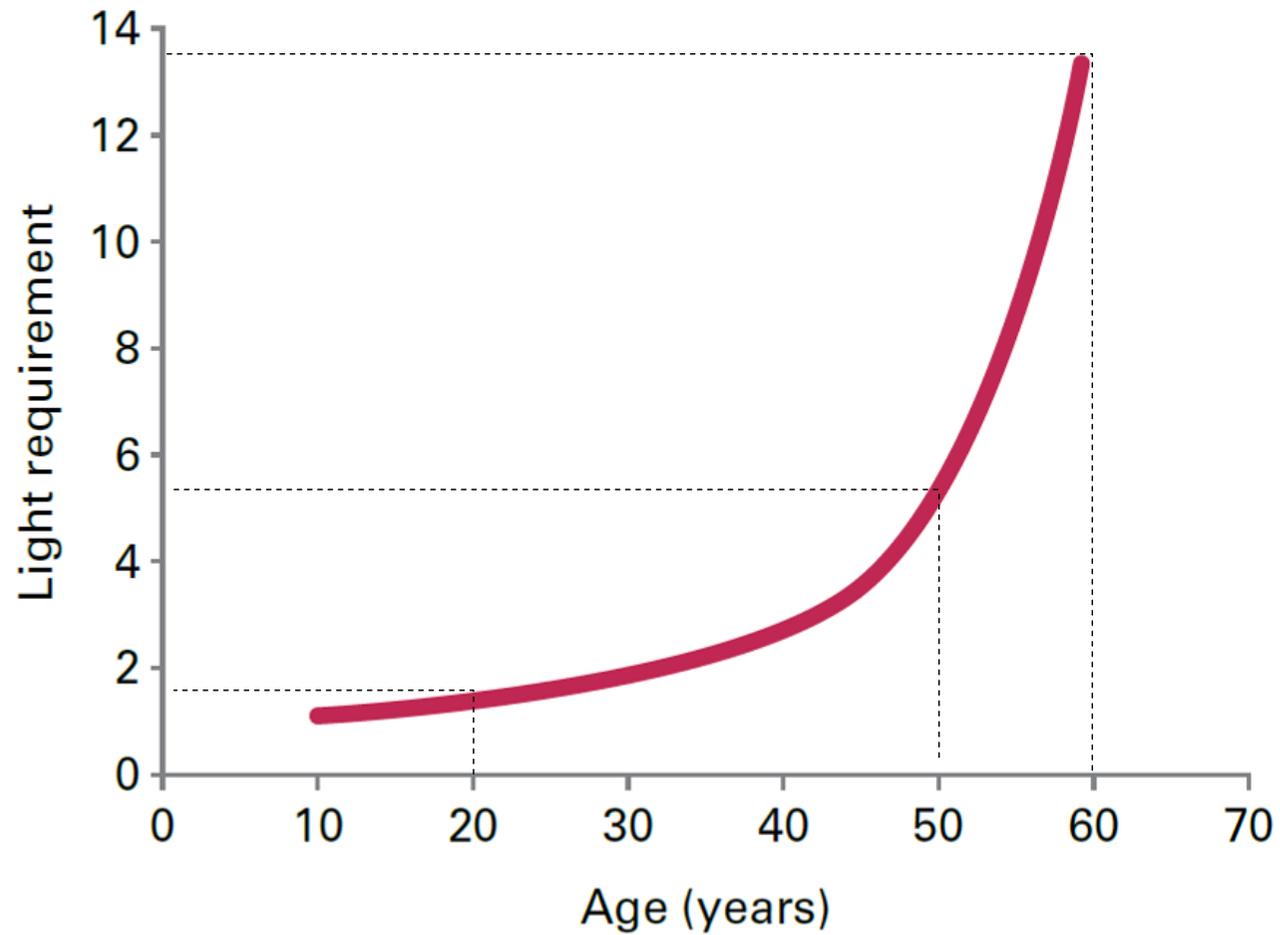
How long

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LIGHTING

First Principles

- Visual acuity

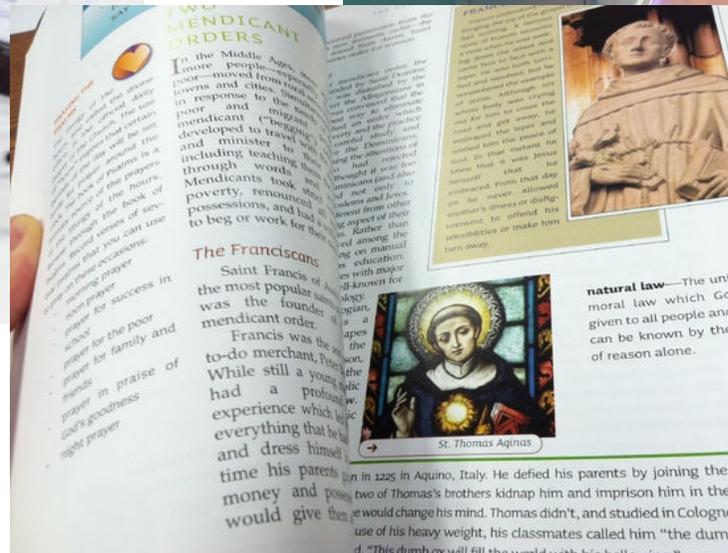


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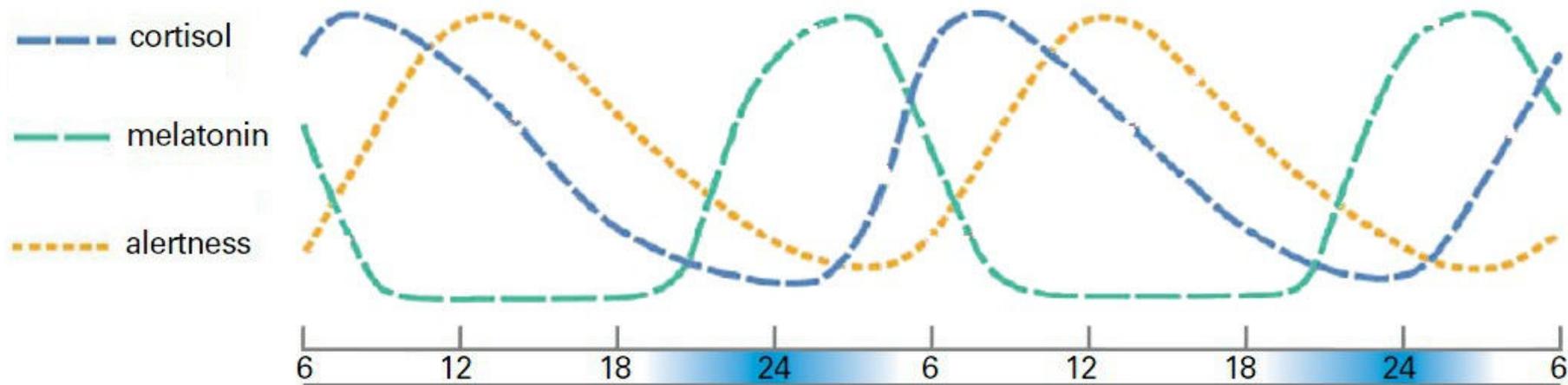
LIGHTING

Who?

- Task difficulty

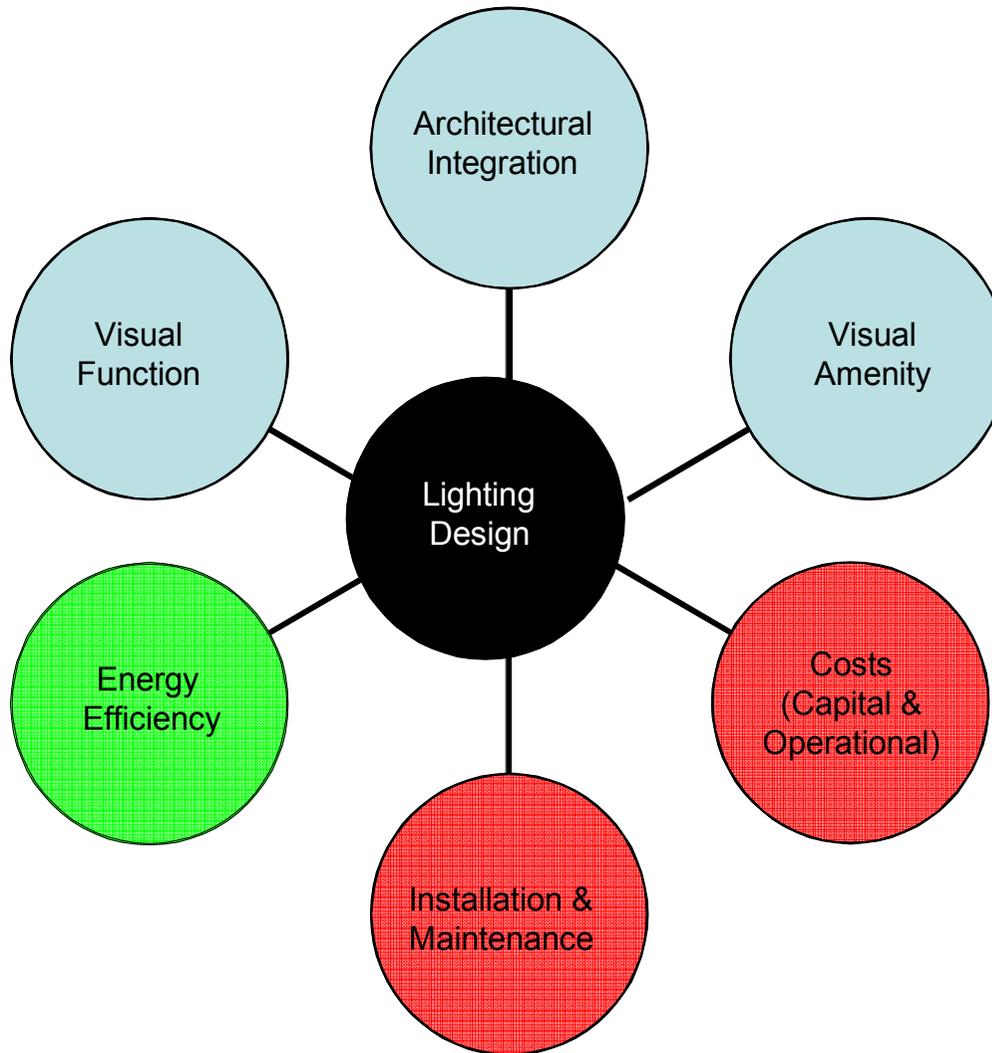


- Circadian rhythm
 - Cortisol - stress hormone
 - Melatonin - sleep hormone



- Eyestrain



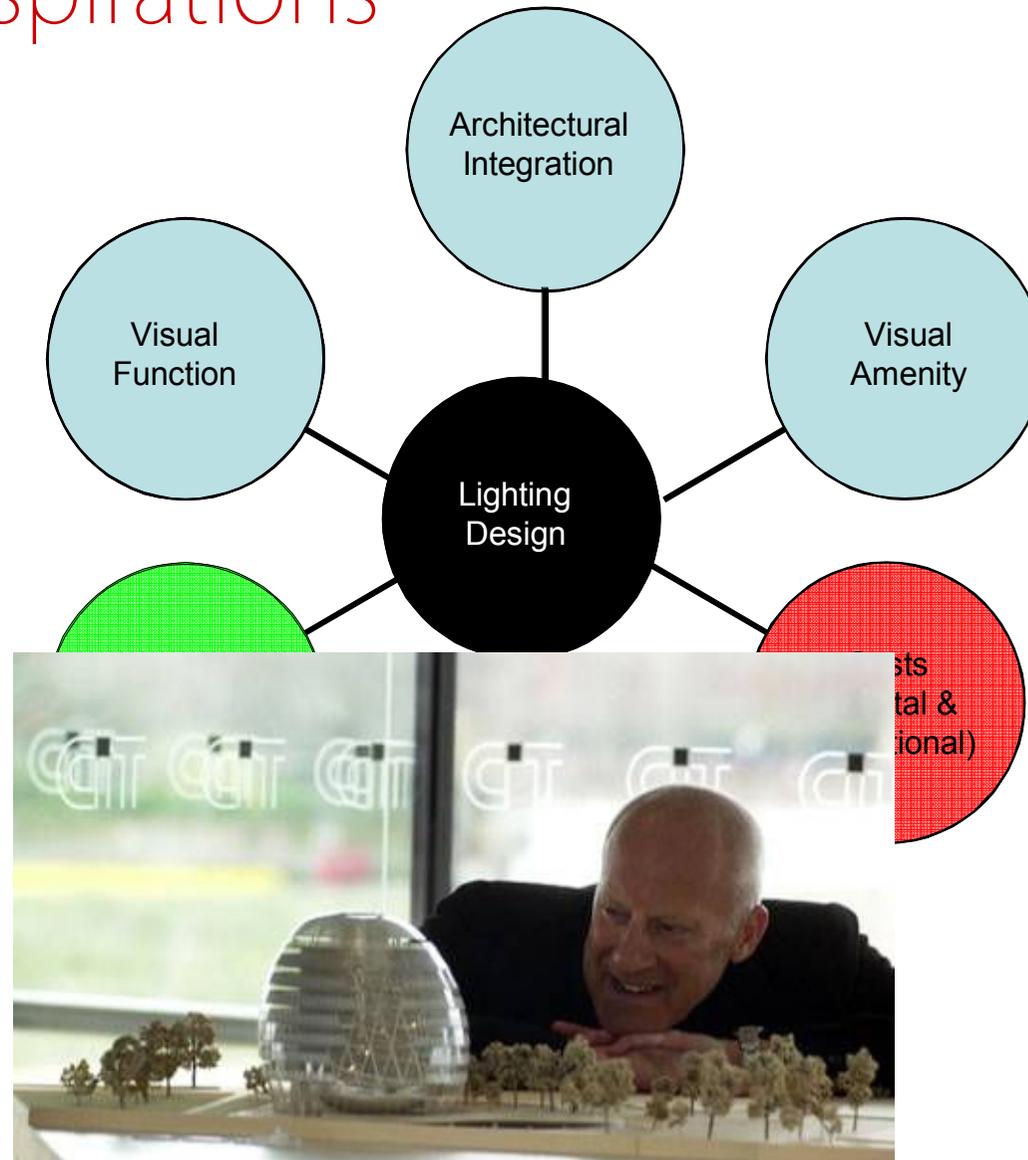


Environment

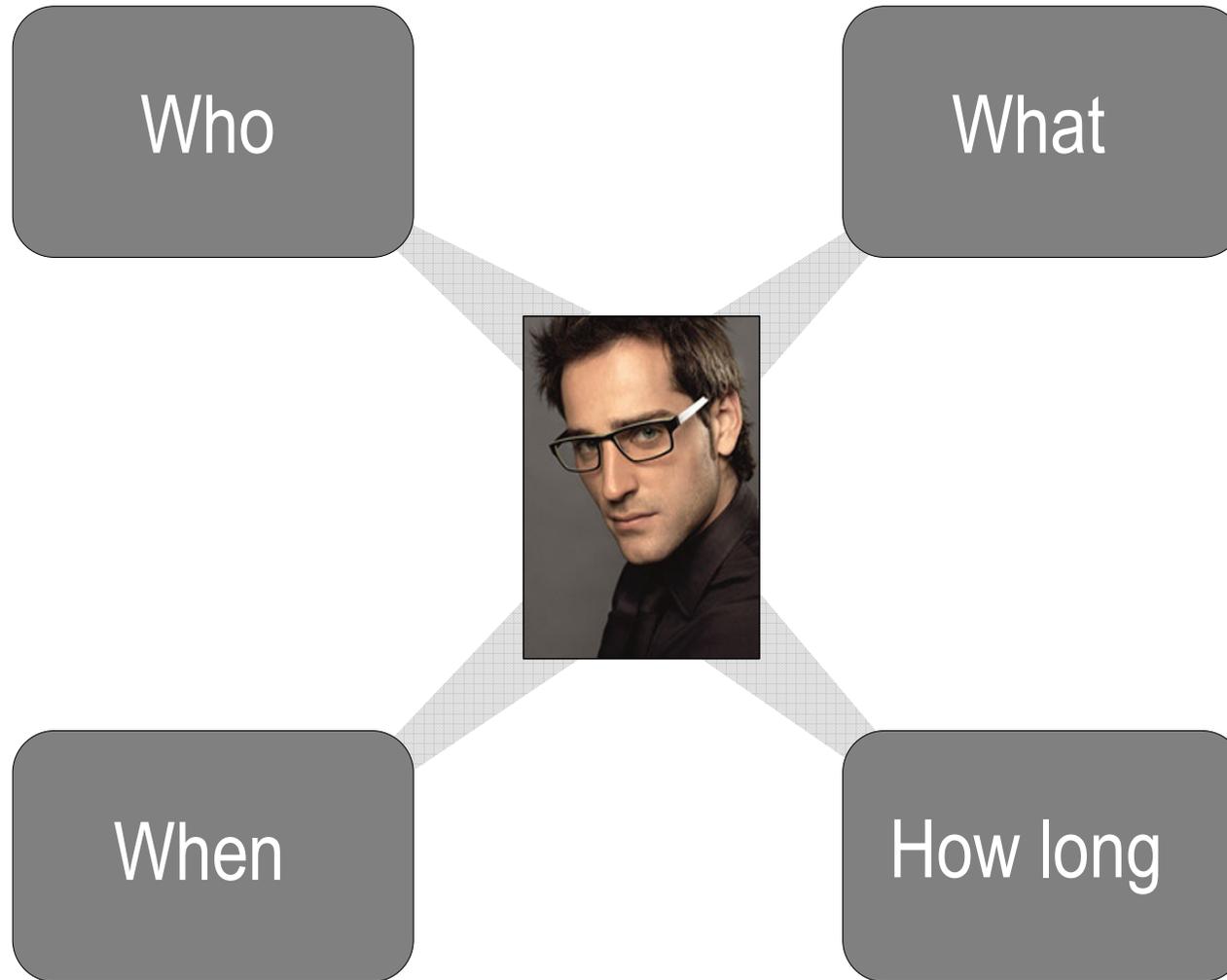
Legislation

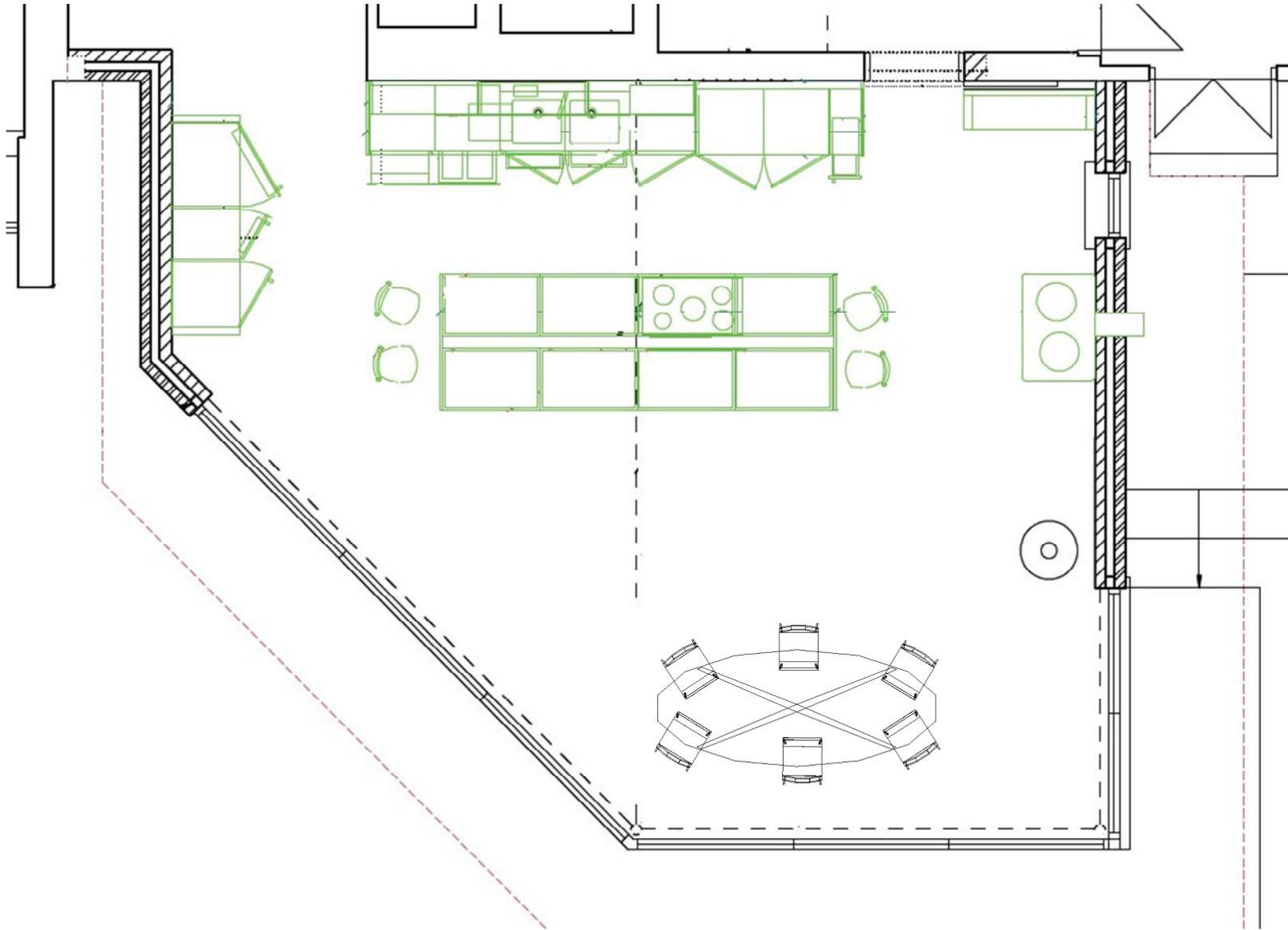
Technology

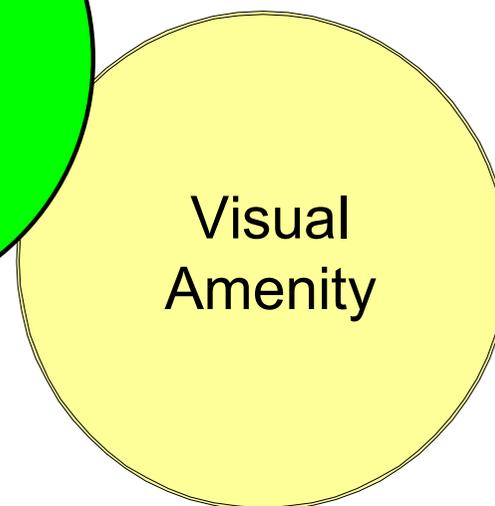
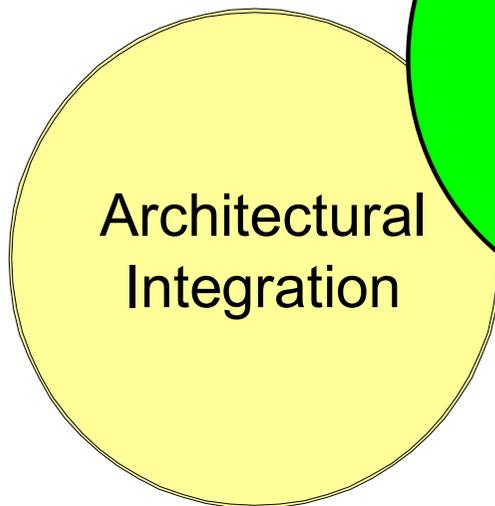
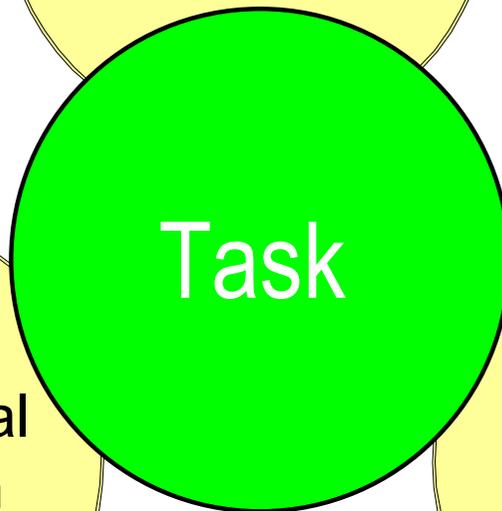
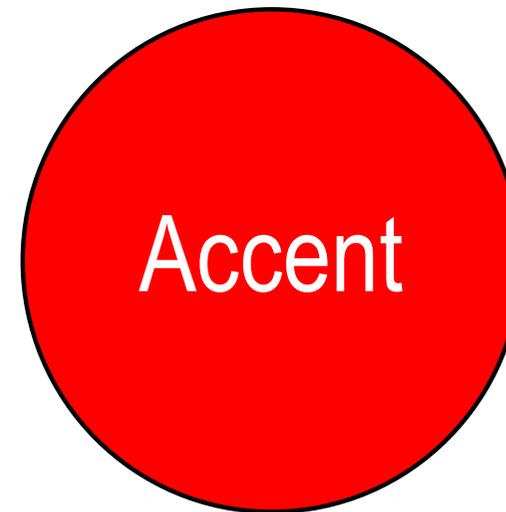
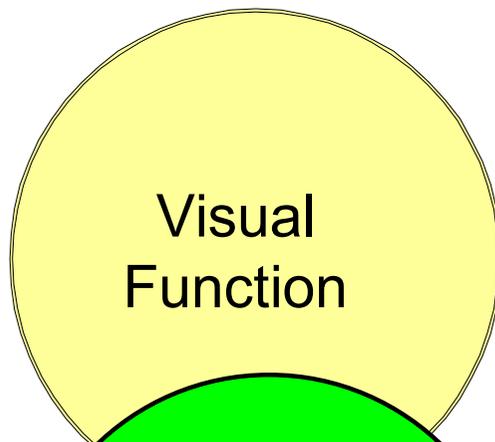
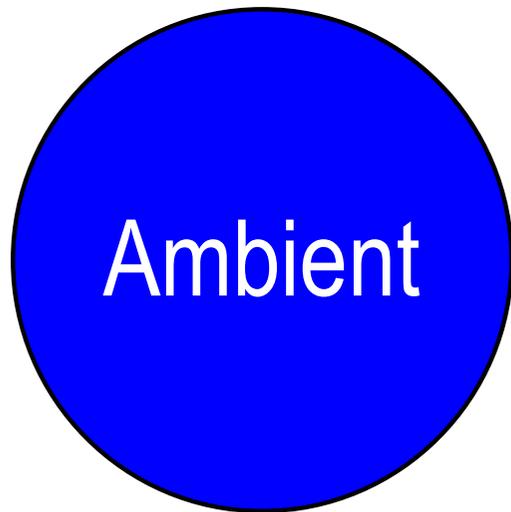
- Aspirations

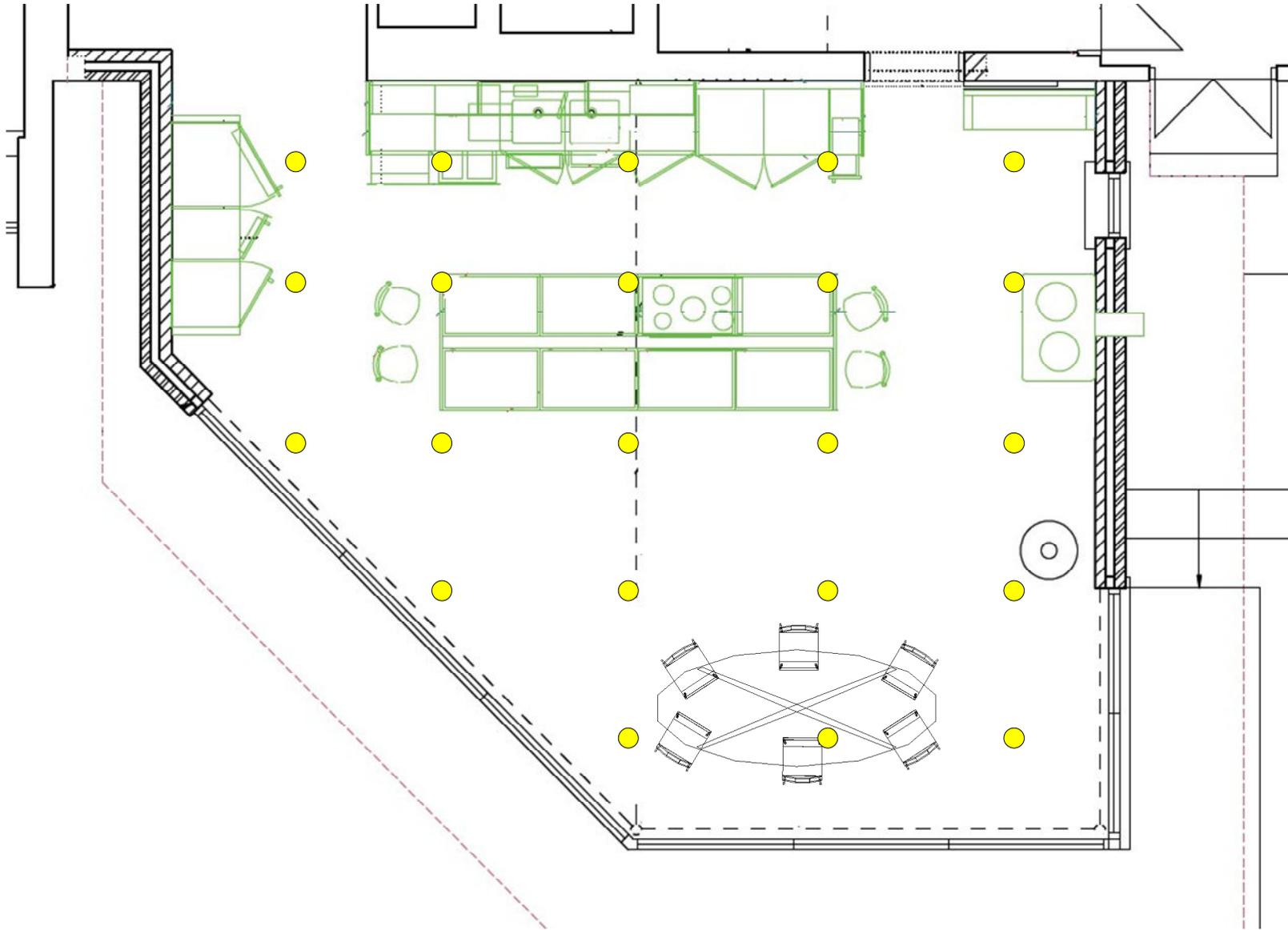


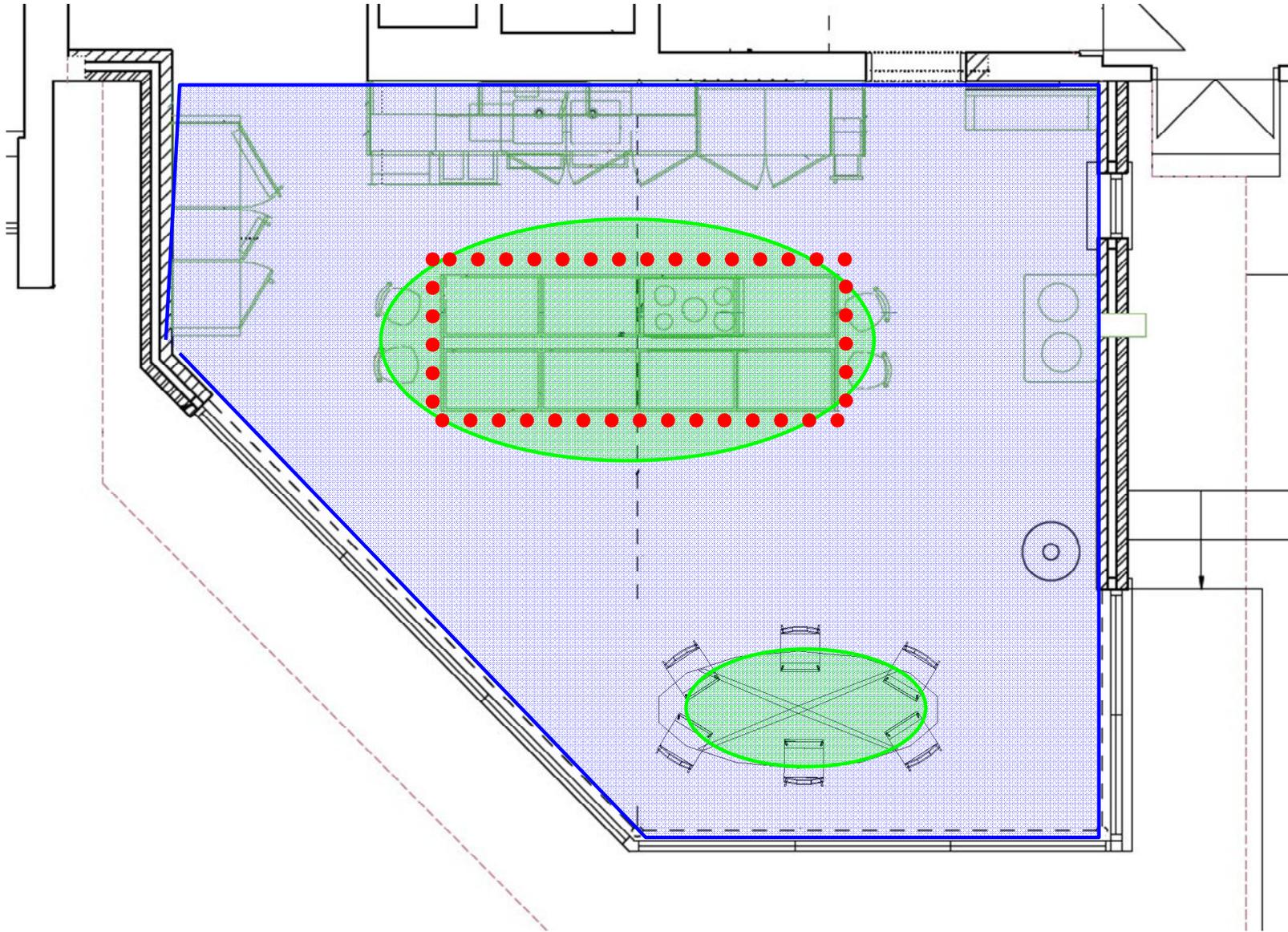
- Visual function

















- Visual amenity



- Visual amenity



- Visual amenity



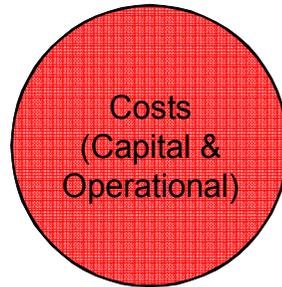
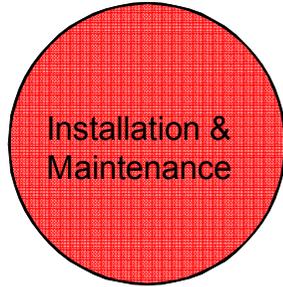
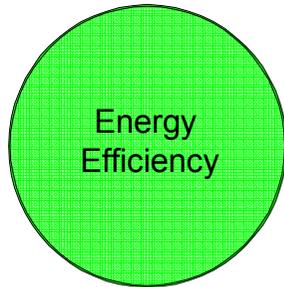
- Architectural Integration



- Architectural Integration



- Considerations



- Installation & Maintenance



- Installation & Maintenance



- Capital & Operating Costs

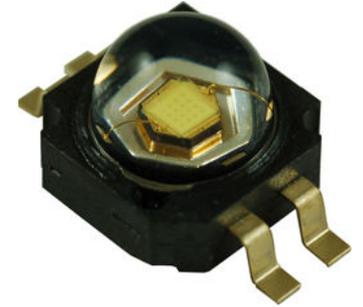


- Energy Efficiency





Lighting palettes



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LIGHTING

 *Lamps*



“If it looks like a duck, swims like a duck, and quacks like a duck, then it probably is a duck”



unless it is a peanut

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LIGHTING

- Life
- Efficacy
- Lumen Output
- Colour Rendering
- Colour Temperature
- Dimmability
- Warm-up time
- Re-strike time

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Lamps



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LIGHTING



Luminaires

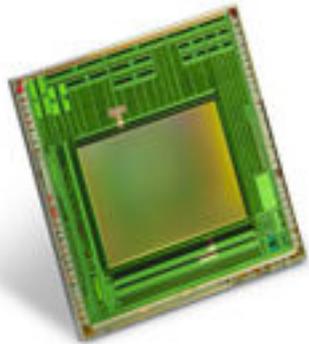
- Mounting position
- Building fabric
- Other building services
- Size
- Form
- Architecture
- Adjustability
- Emergency compatibility

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LIGHTING



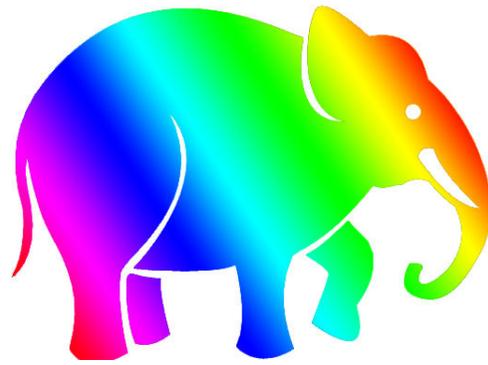
Luminaires



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Controls



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Colour

RED



USA/UK.....	Danger
France.....	Aristocracy
India.....	Creativity
Japan.....	Anger
China.....	Happiness
Egypt.....	Death

Danger

Sex

Strength

Power

RED

Speed

Passion

Excitement

Aggression

Colour Psychology

LPA



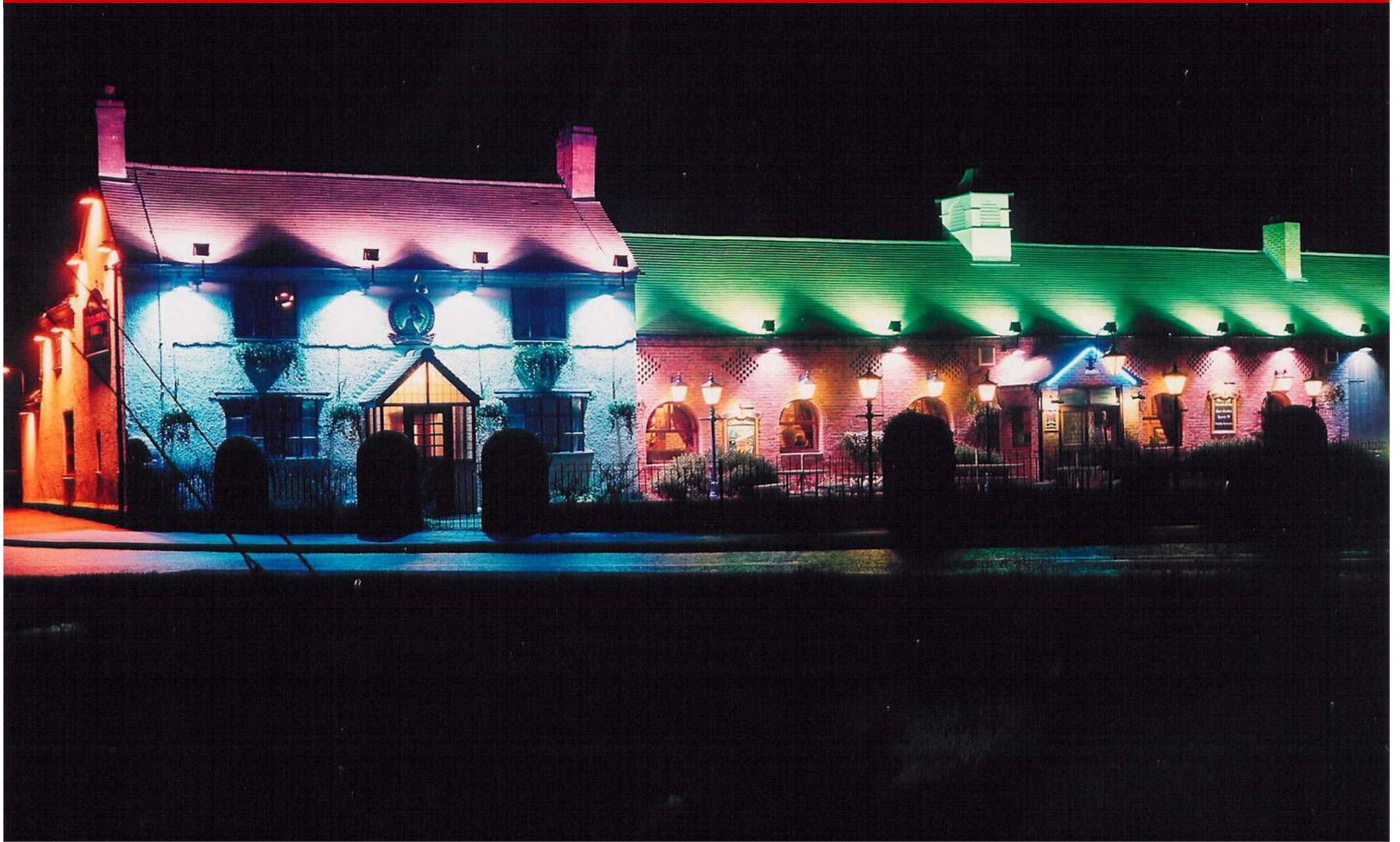
GOOD THINGS COME TO THOSE WHO WAIT.



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LIGHTING





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LIGHTING





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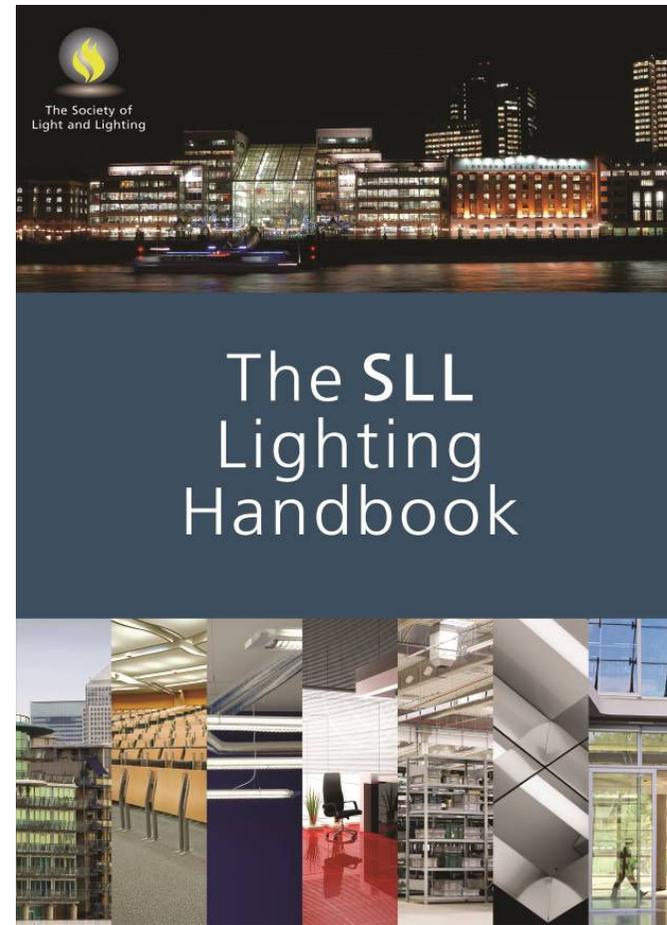
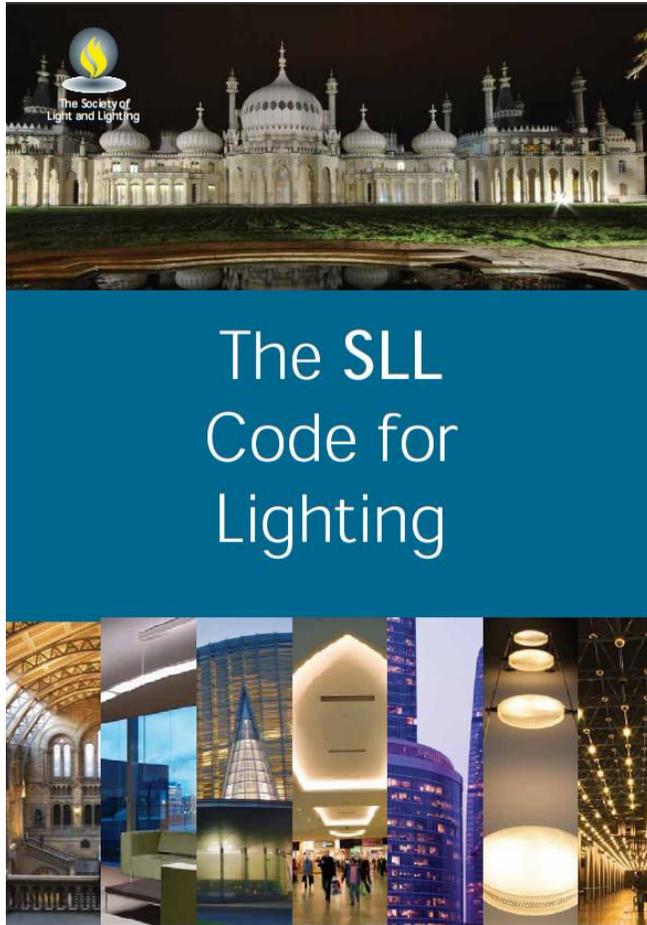




The right light ...

... in the right place ...

... at the right time





IALD



ILP
INSTITUTION OF
LIGHTING
PROFESSIONALS

LPA
LIGHTING

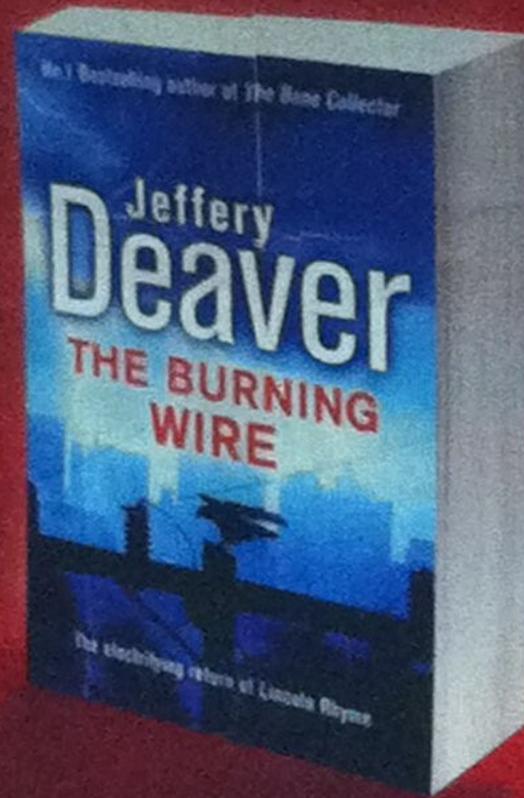
Getting it right





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LIGHTING

Getting it right



The electrifying new Lincoln Rhyme thriller that will make you think twice about turning on the light.

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LIGHTING

Thank you

liz.peck@lpa-lighting.com