# 光 语

20180610

花间一壶酒，独酌无相亲。
举杯邀明月，对影成三人。

**魏铭哲**
Dengguang.com

什么是光影造型？就是通过灯具的明暗、光比、角度、光影、位置来塑造一个物体的完整造型，能体现出物体本身的美感以及内在的精神！

不同时间段的变化就是光比的变化（温度除外）

明月几时有？把酒问青天。

中国的文学，就是月光文学

光一无声的语言

光一无声的语言

光一无声的语言

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PROLICHT

Dengguang.com 38°论坛 汇聚光 品味光

# 光的品 质

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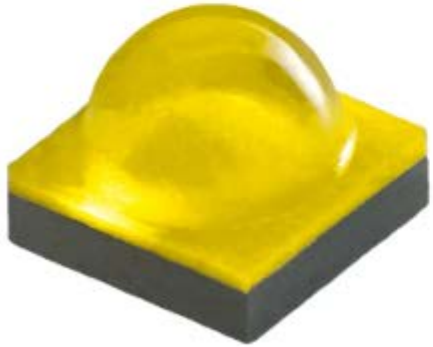
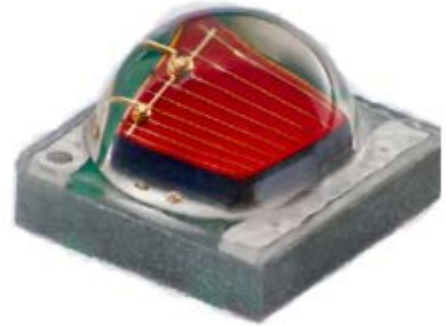
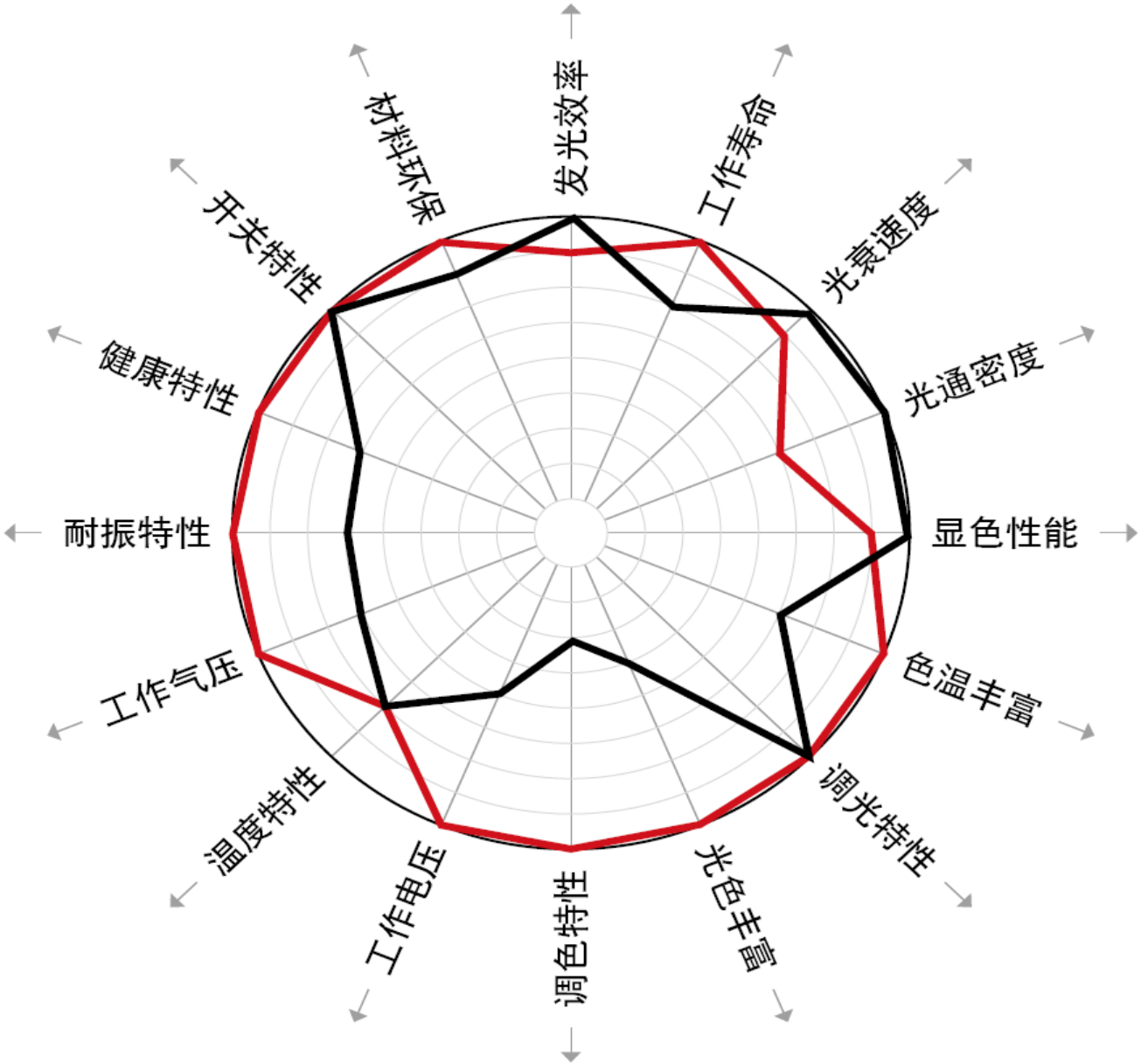
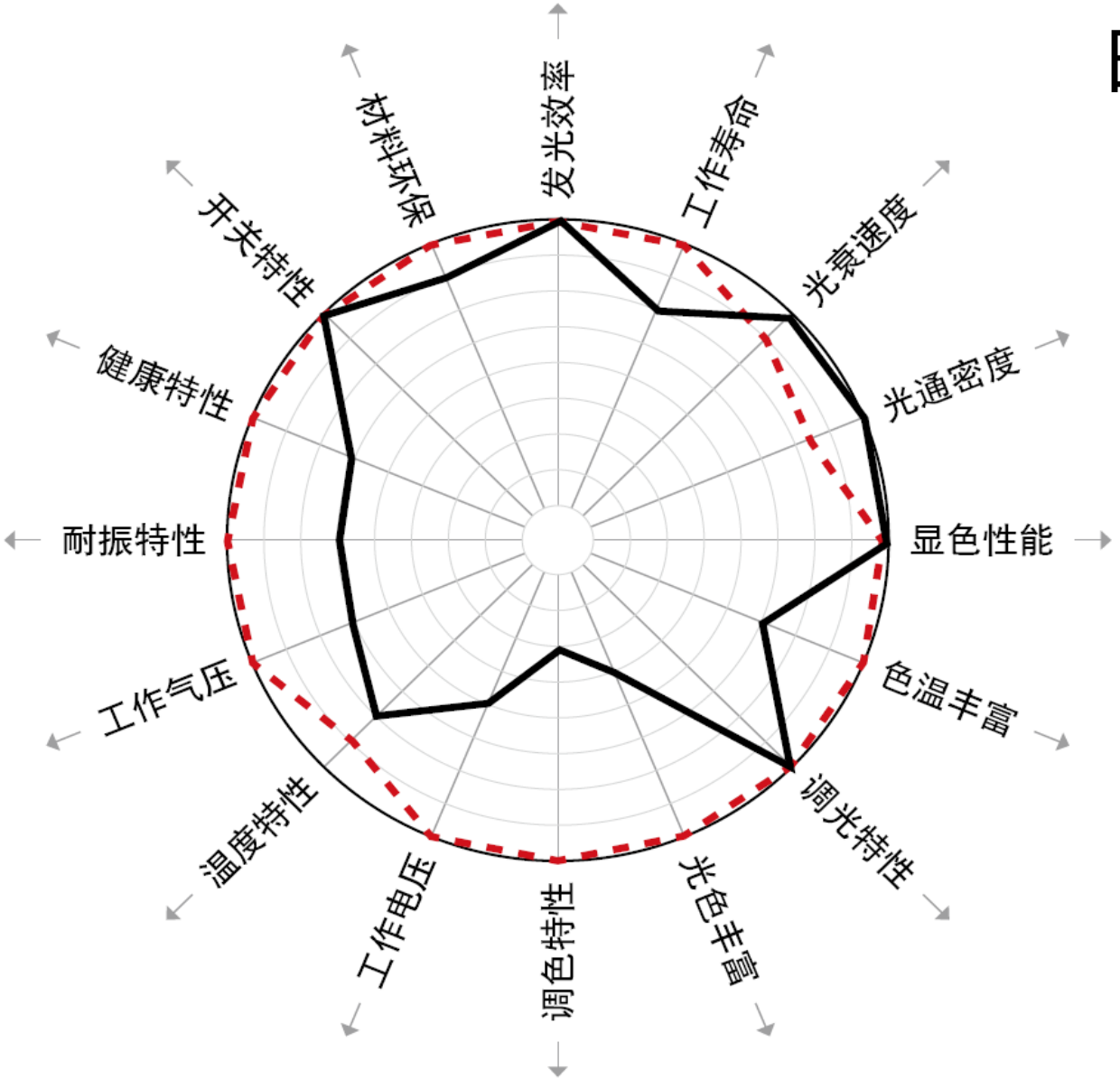
# Cree® XLamp® XB-D LEDs



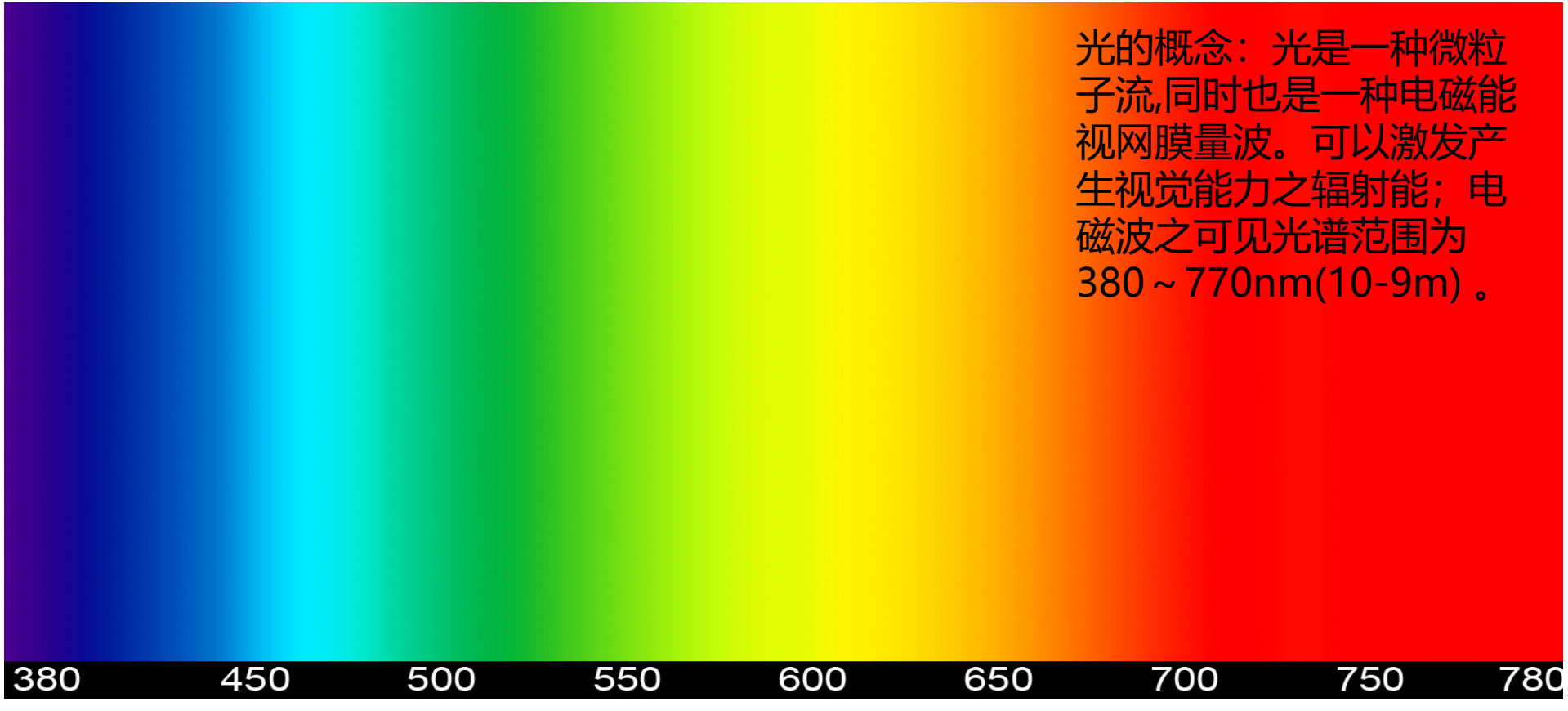



发光效率
工作寿命
光衰速度
光通密度
显色性能
色温丰富
调光特性
光色丰富
调色特性
工作电压
温度特性
工作气压
耐振特性
健康特性
开关特性
材料环保
TLS
LED

# 白光LED可预见的发展

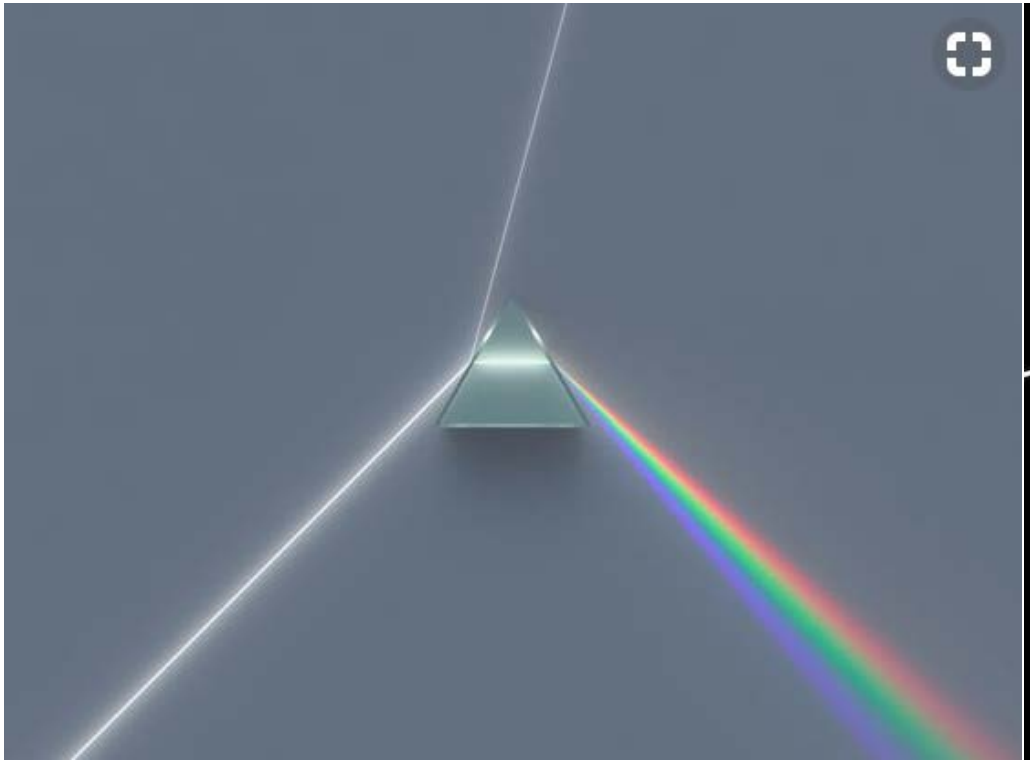


# 可见光光谱




光的概念：光是一种微粒子流,同时也是一种电磁能视网膜量波。可以激发产生视觉能力之辐射能；电磁波之可见光谱范围为380～770nm(10-9m)。

# 光谱



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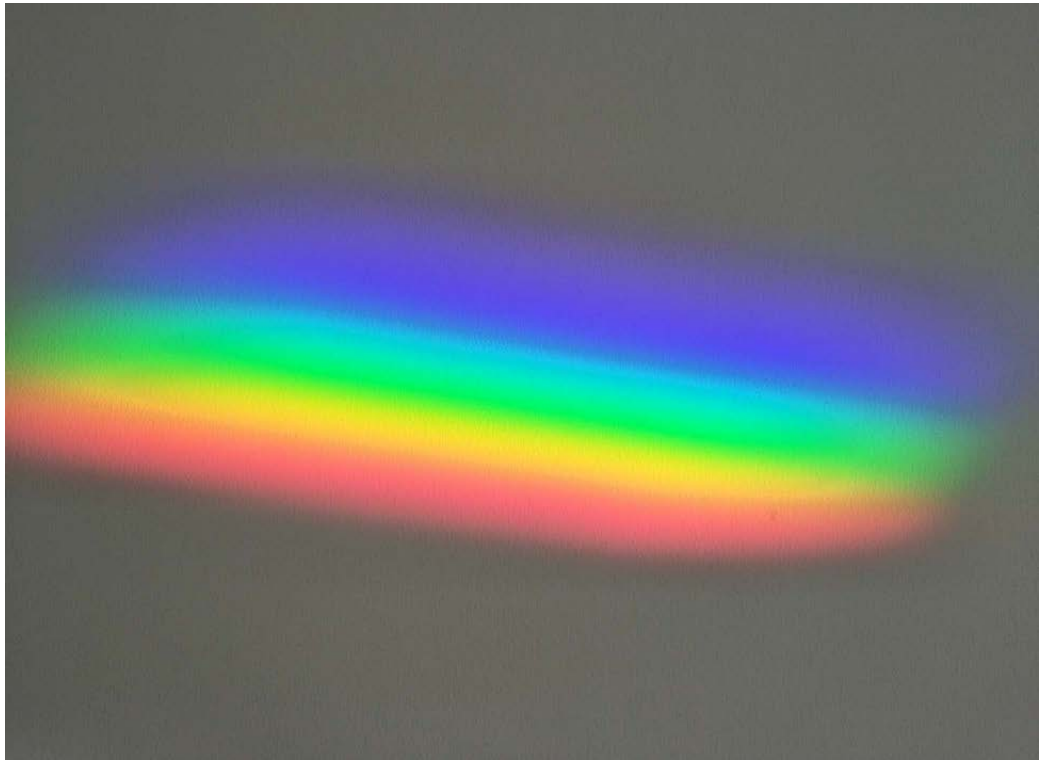
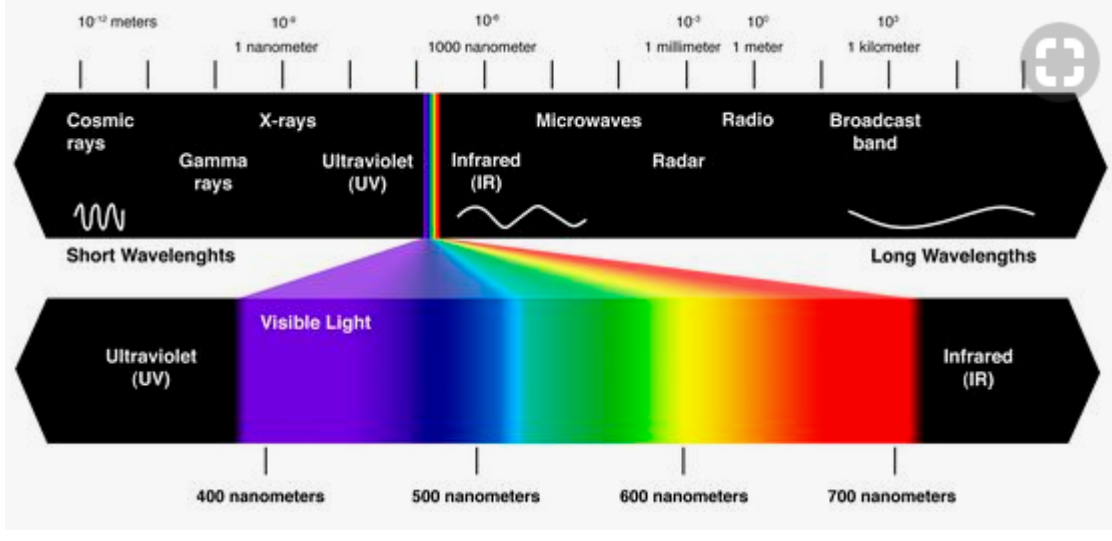
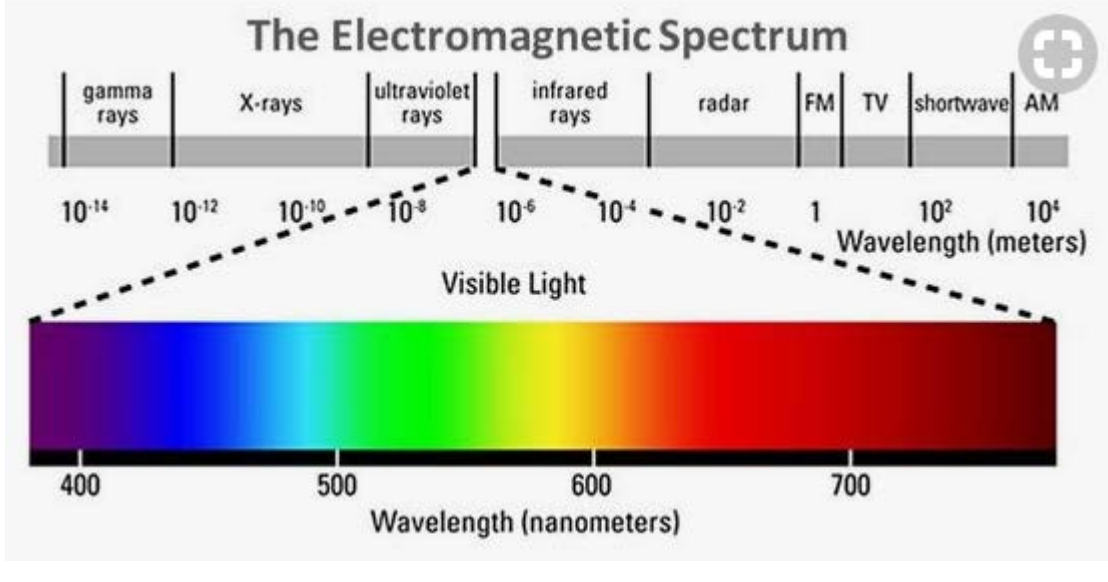
# 光谱

# 光谱

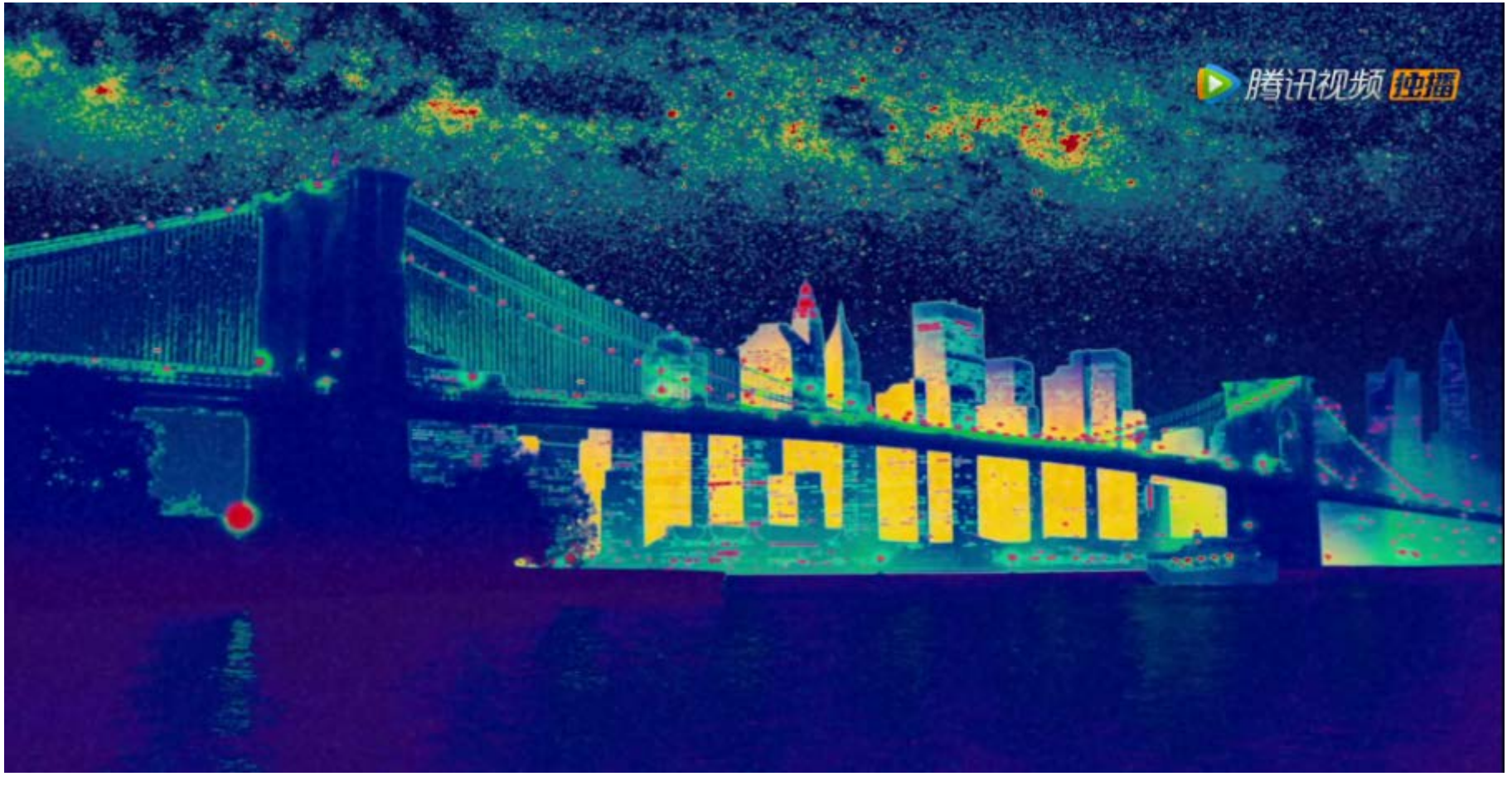


# 光谱

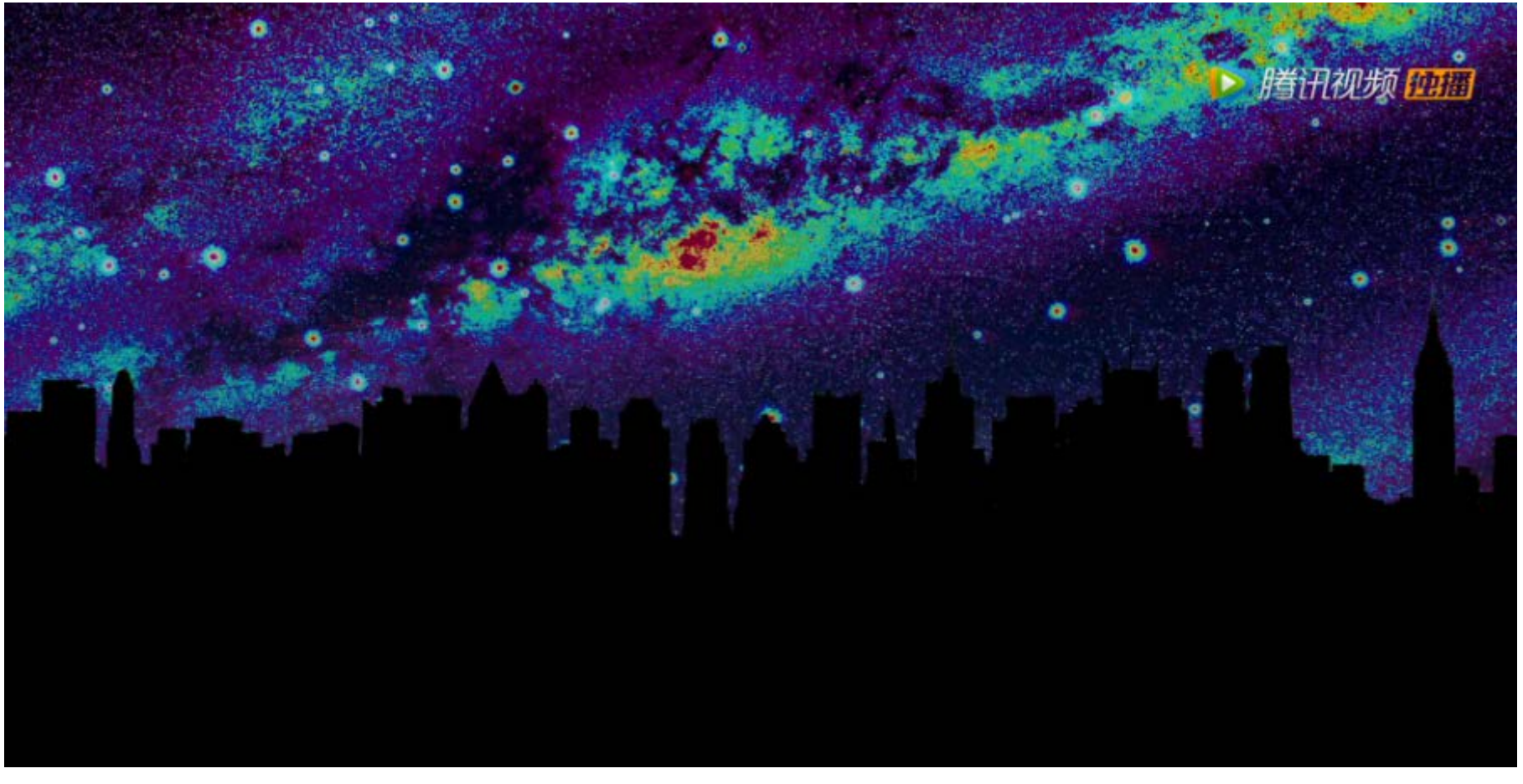

1 nanometer
1000 nanometer
1 millimeter
1 meter
1 kilometer
Cosmic rays
Gamma rays
X-rays
Ultraviolet (UV)
Infrared (IR)
Microwaves
Radar
Radio
Broadcast band
Short Wavelenghts
Long Wavelengths
Ultraviolet (UV)
Visible Light
Infrared (IR)
400 nanometers
500 nanometers
600 nanometers
700 nanometers


The Electromagnetic Spectrum
gamma rays
X-rays
ultraviolet rays
infrared rays
radar
FM
TV
shortwave
AM
10-14
10-12
10-10
10-8
10-6
10-4
10-2
1
102
104
Wavelength (meters)
Visible Light
400
500
600
700
Wavelength (nanometers)

自然光



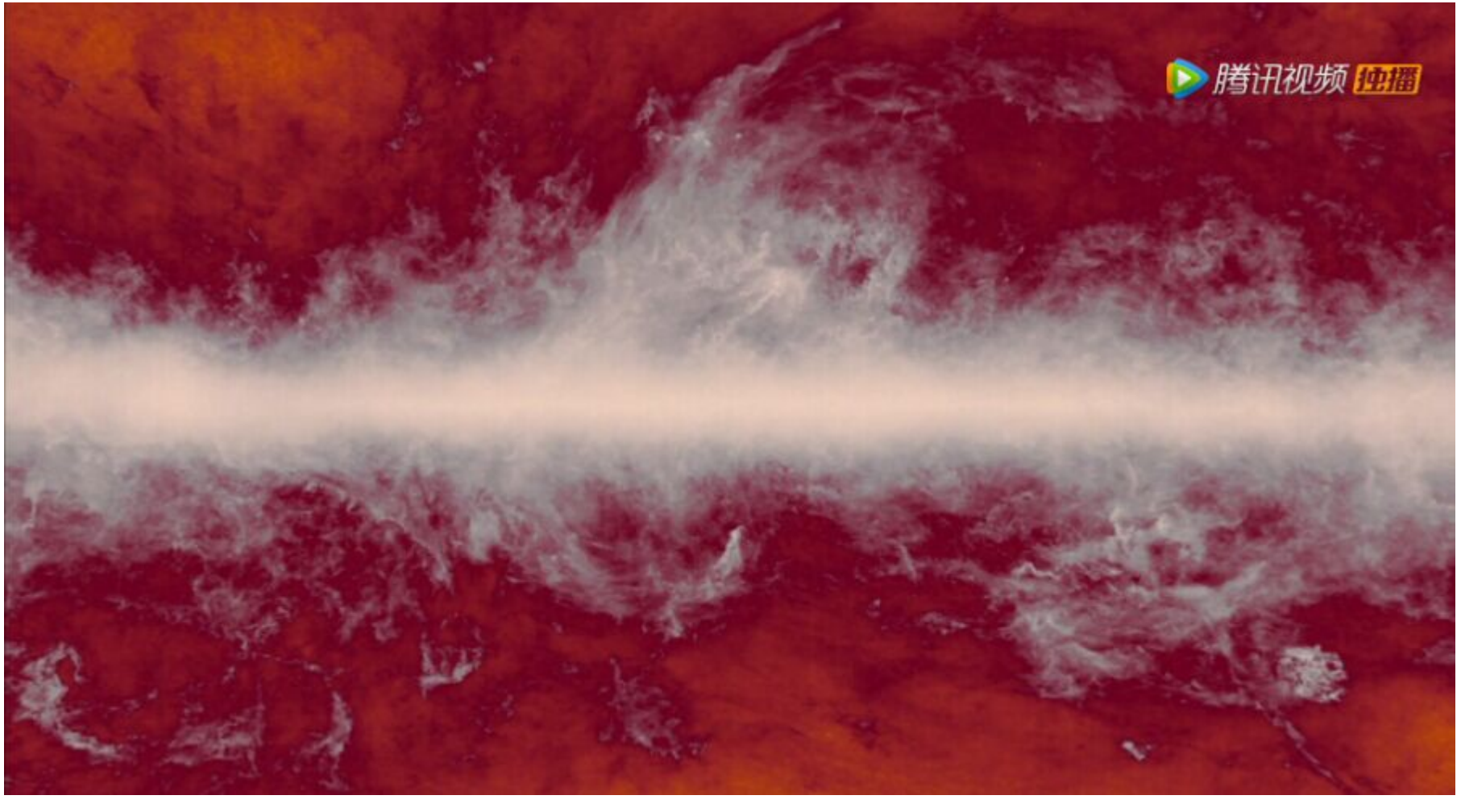

红外线




伽马射线

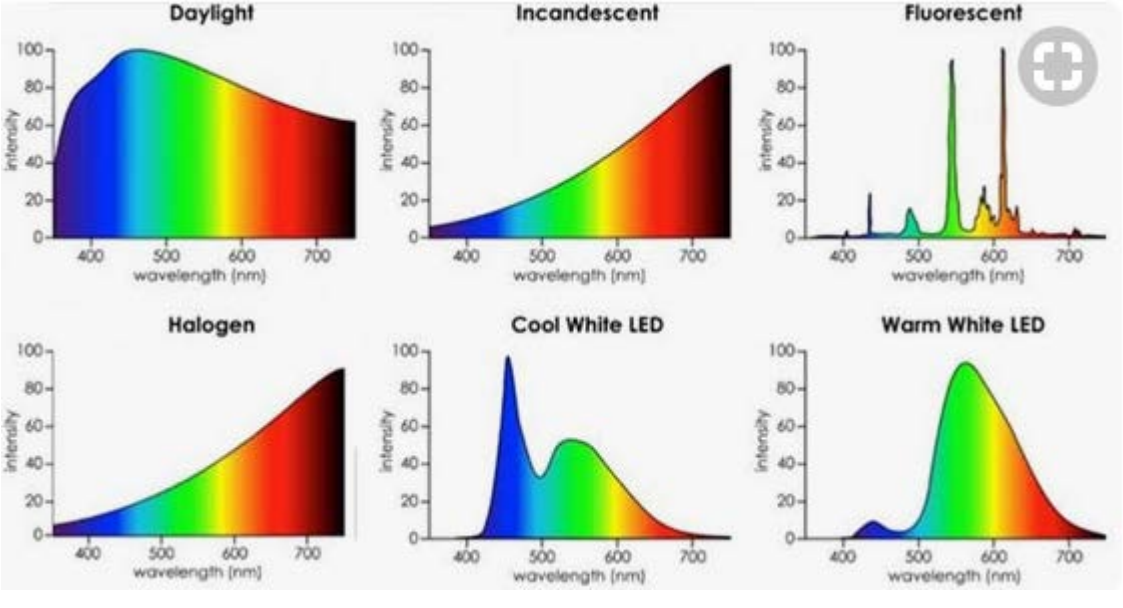
X光

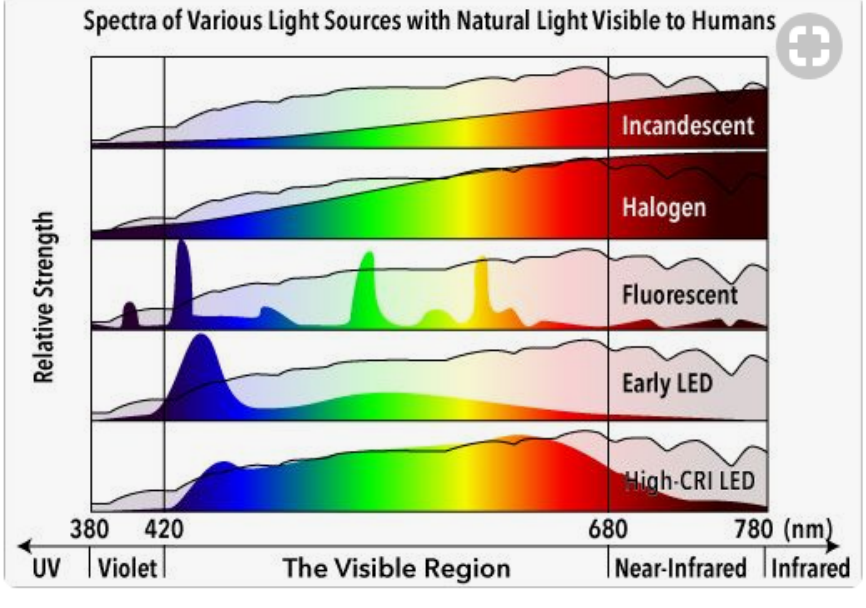
无线电光



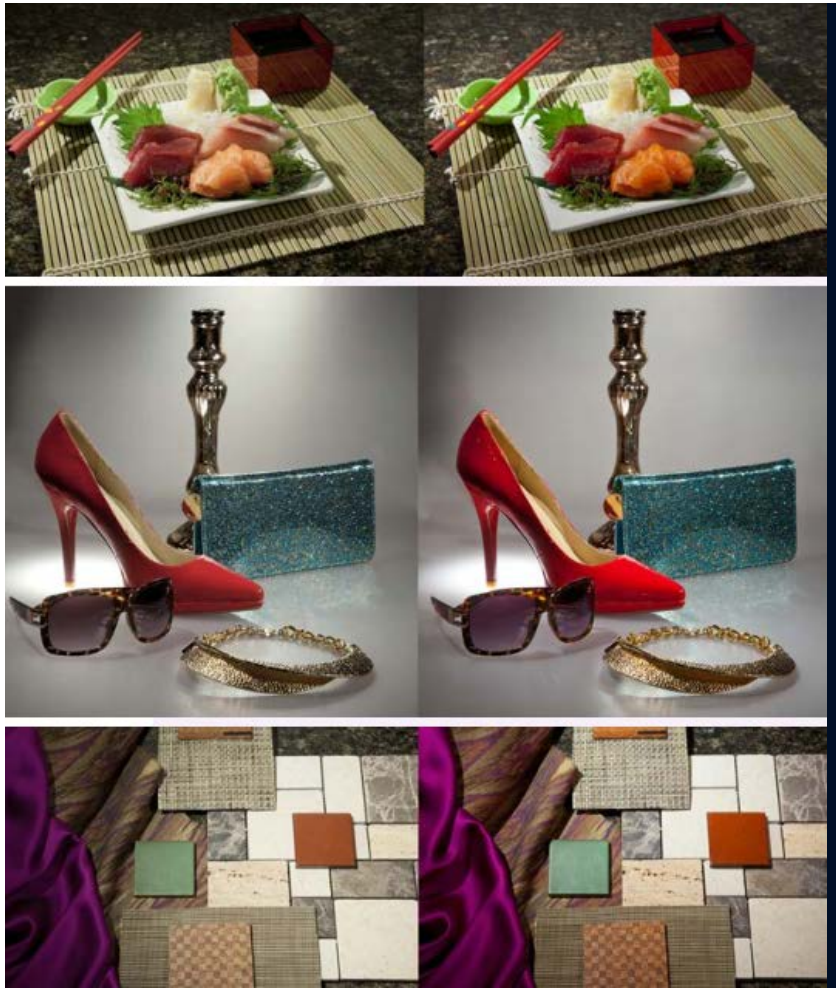

微波光

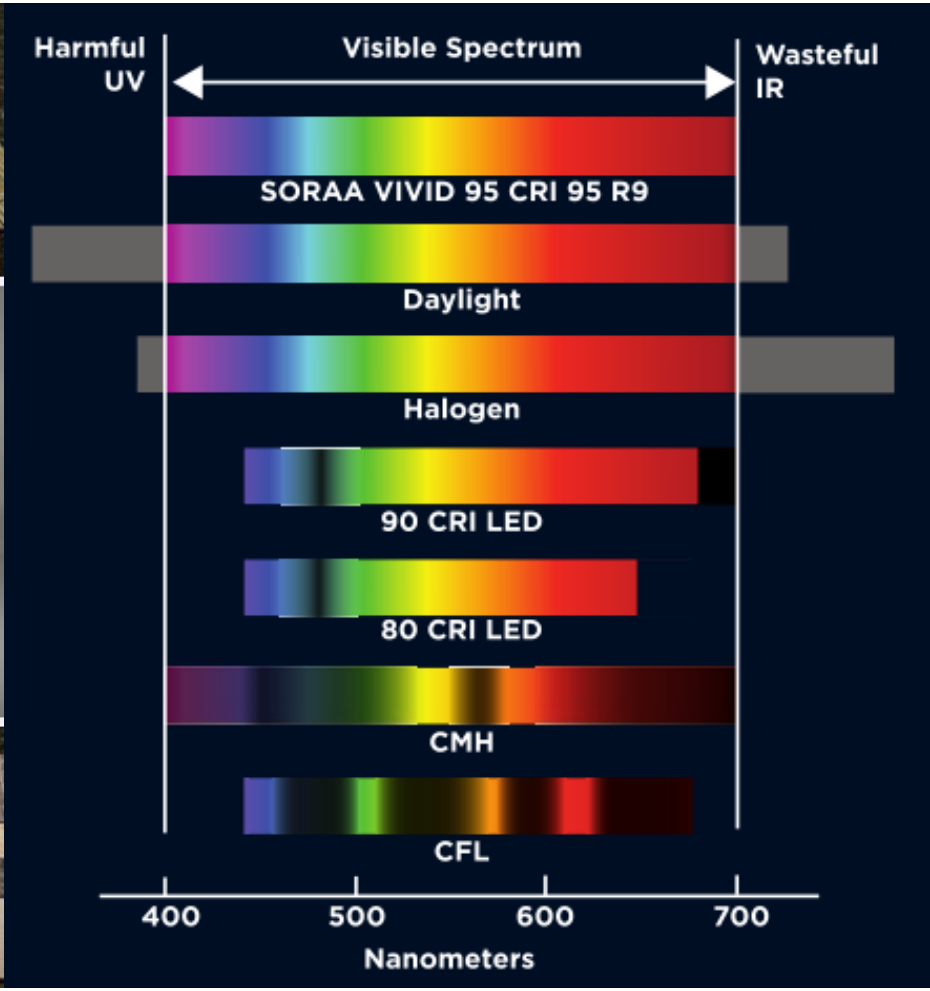
# 光谱


Daylight
Incandescent
Fluorescent
Halogen
Cool White LED
Warm White LED
intensity
wavelength (nm)
0
20
40
60
80
100
400
500
600
700


Spectra of Various Light Sources with Natural Light Visible to Humans
Relative Strength
Incandescent
Halogen
Fluorescent
Early LED
High-CRI LED
380
420
680
780 (nm)
UV
Violet
The Visible Region
Near-Infrared
Infrared

# 光谱




Harmful
UV
Visible Spectrum
Wasteful
IR
SORAA VIVID 95 CRI 95 R9
Daylight
Halogen
90 CRI LED
80 CRI LED
CMH
CFL
400
500
600
700
Nanometers

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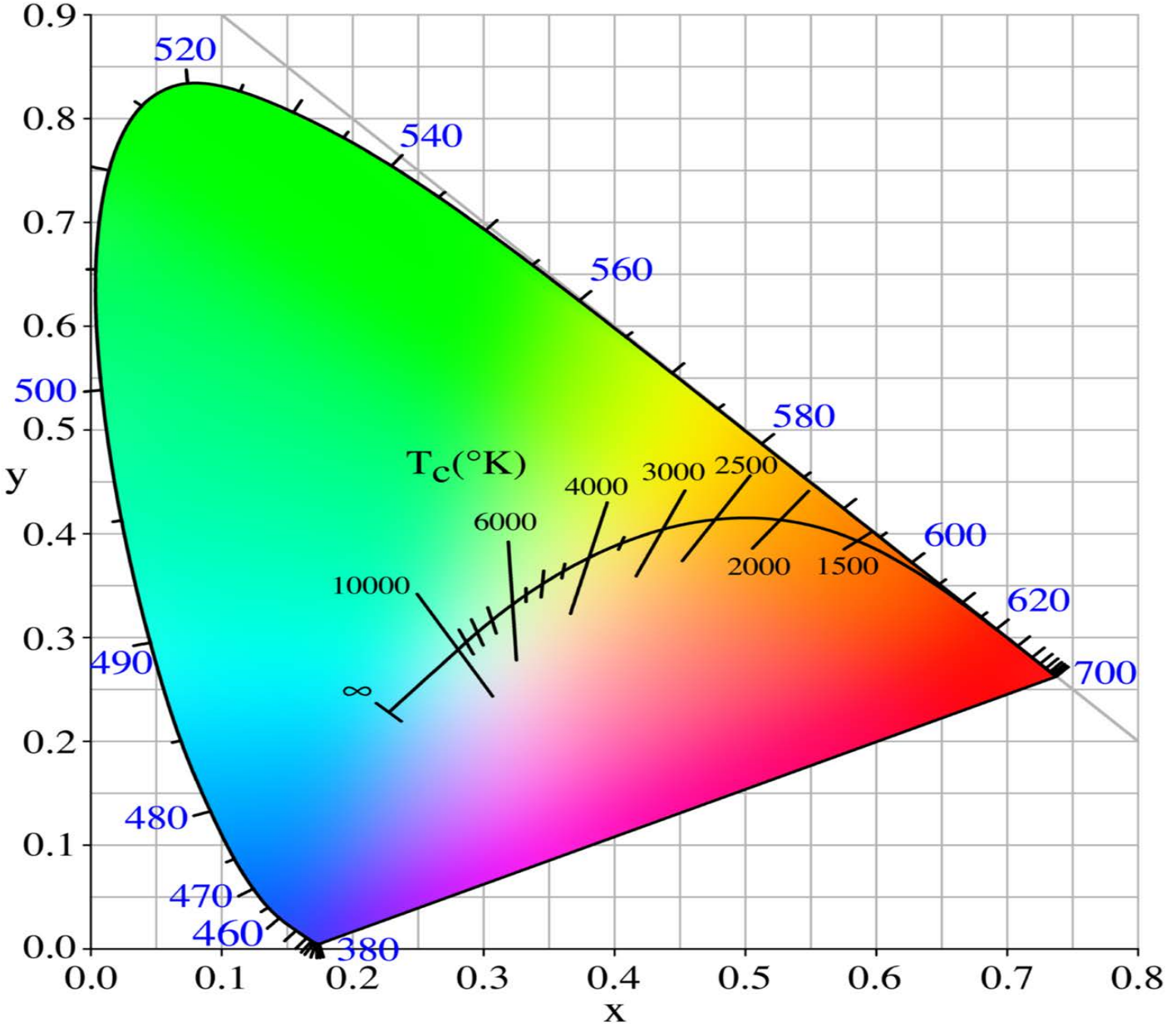
# 色温CCT

WW<3300K
NW
DW>5300K

光源发射光的颜色与黑体在某一温度下辐射光色相同时，黑体的温度成为该光源的色温-也是表现时间-心理-氛围的一种变化！



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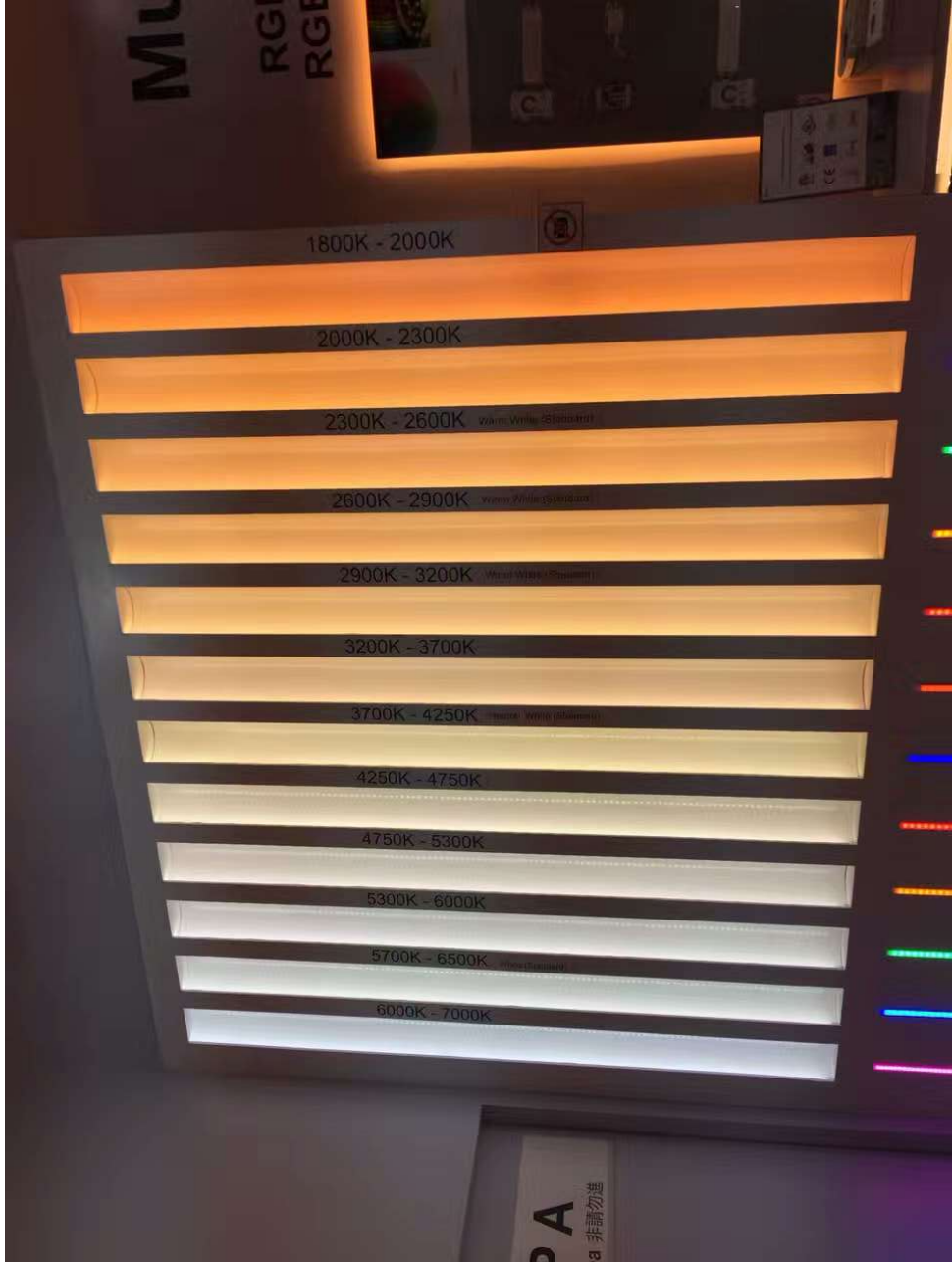

# 色温CCT

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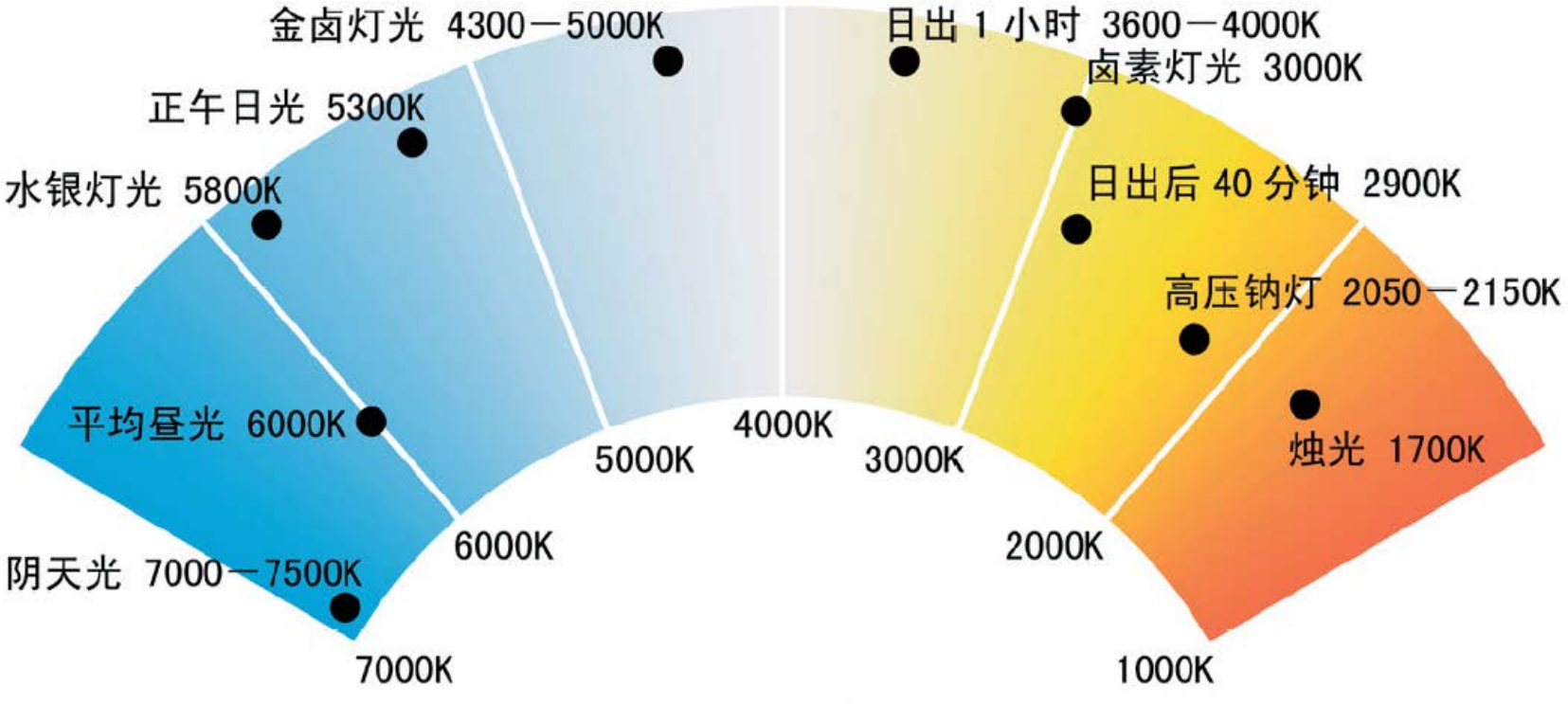
# 色温CCT

# 色温CCT

HONOURTEK
1700K
2000K
2500K
2800K
3000K
3000K
3200K
3400K
9000K
7000K
6000K
5000K
4500K
4000K
4000K
3500K

# 色温CCT

# 色温CCT




太阳及光源色温谱

De

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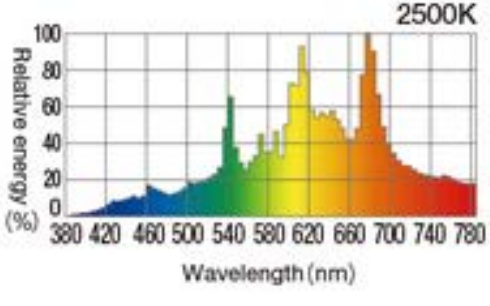
Deng

# 色温CCT

The Light.
Zumtobel. Your light for life.
Come and see us at Light + Building 2016 and experience for yourself how the right light can accompany people individually throughout the day and even at night.

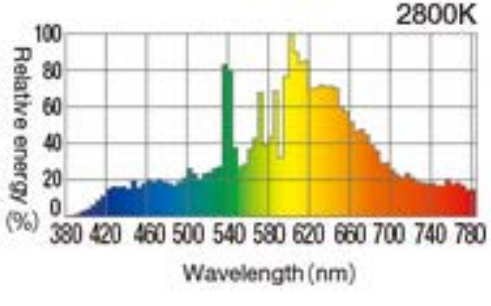
# 色温CCT

## 2500K



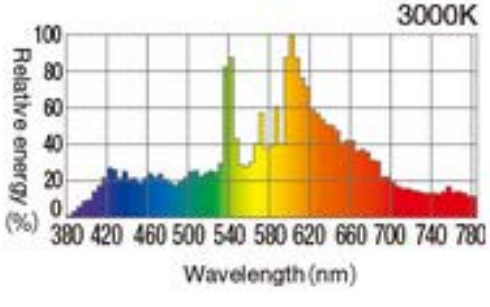

A welcoming, the calm of the late afternoon sun

## 2800K




A soft, calming environment

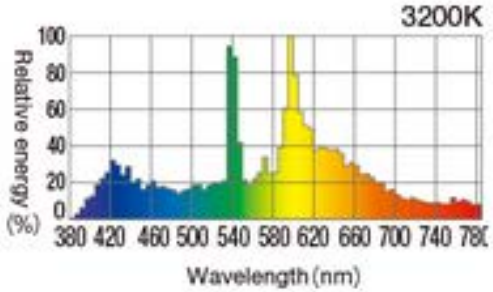
## 3000K




A relaxing, comfortable environment

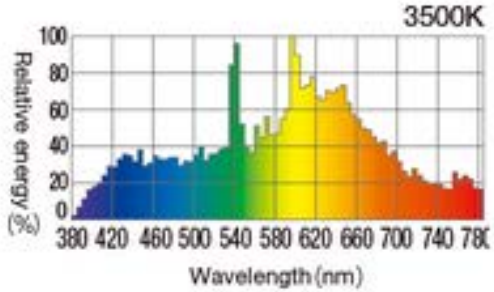
# 色温CCT

## 3200K



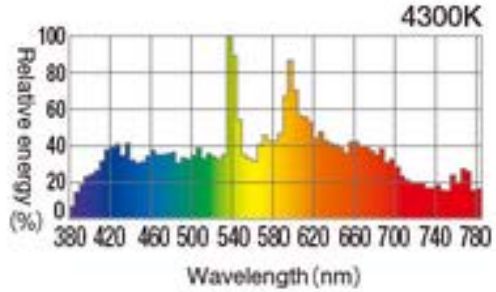

A twilight - like environment of tranquillity

## 3500K




A fresh, elegant environment

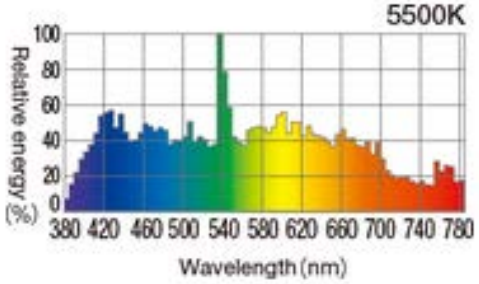
## 4100-4300K




An energetic, natural environment

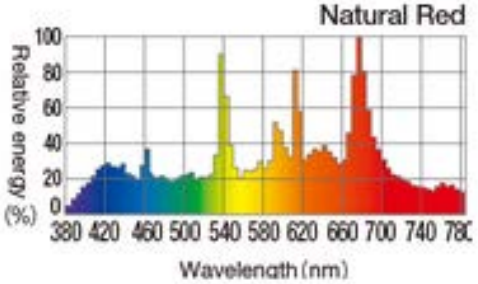
# 色温CCT

## 5500K




A fresh, vibrant environment, resembling the clear midday sun

## 3600K (Natural Red)




Accentuates and maximizes the true beauty of red

南

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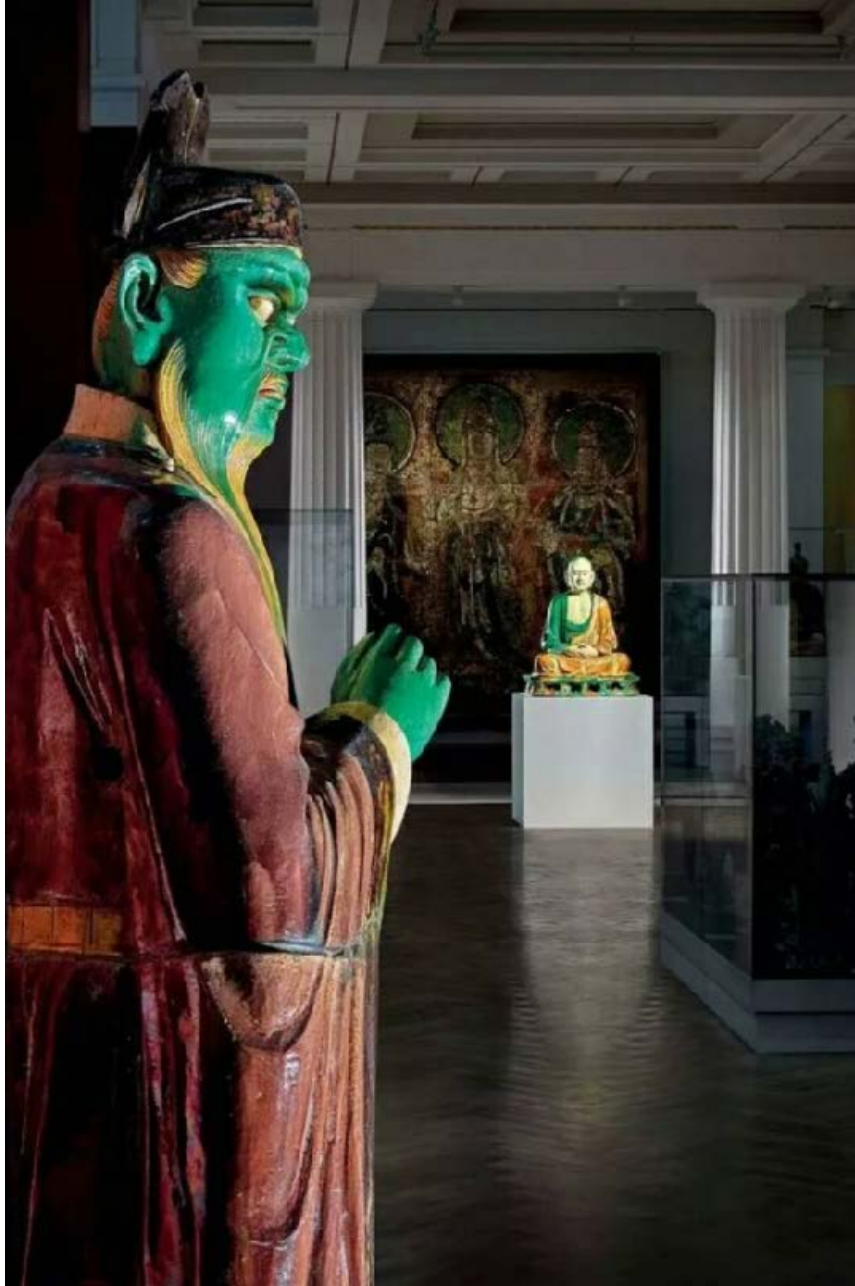

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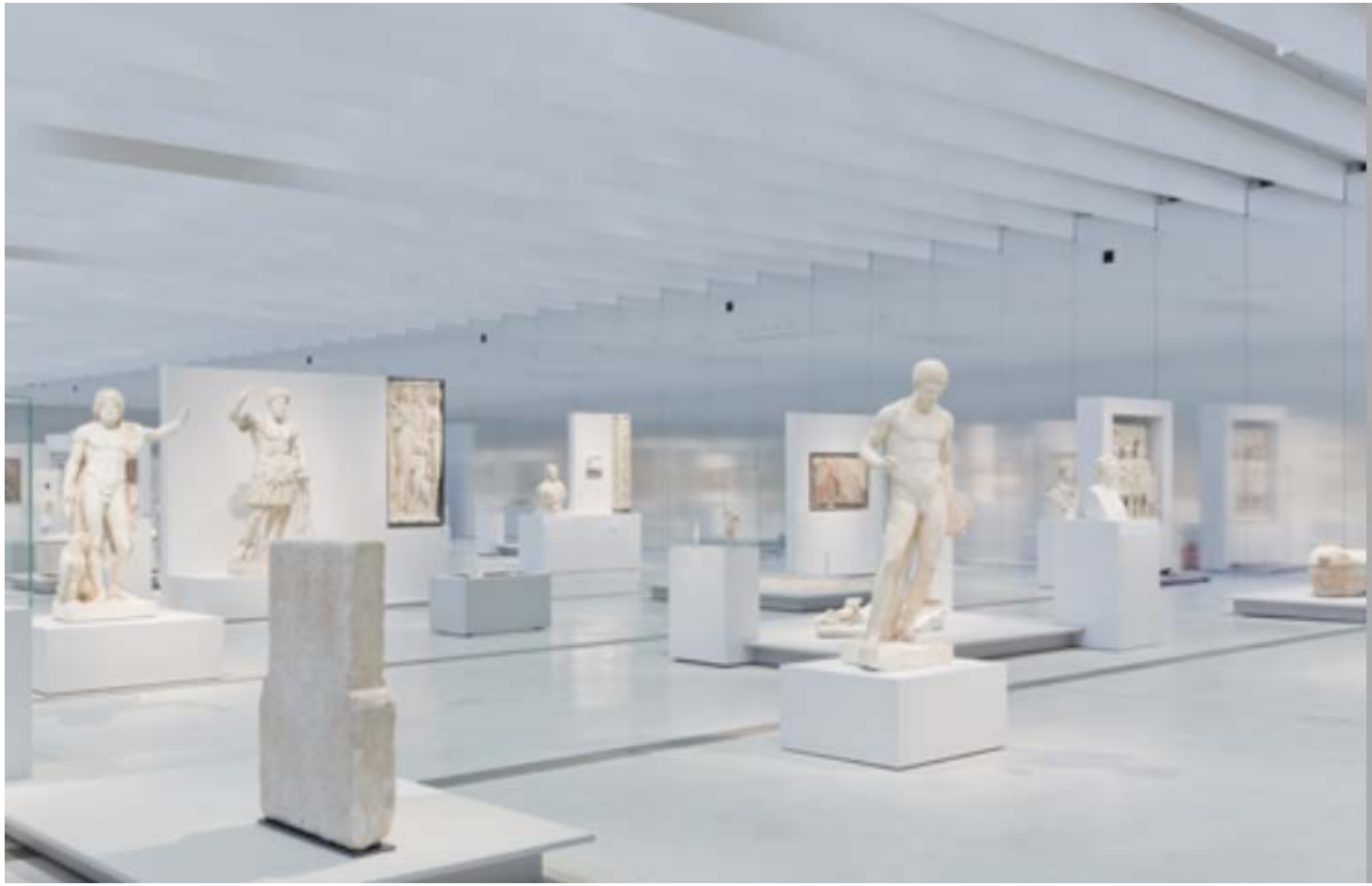

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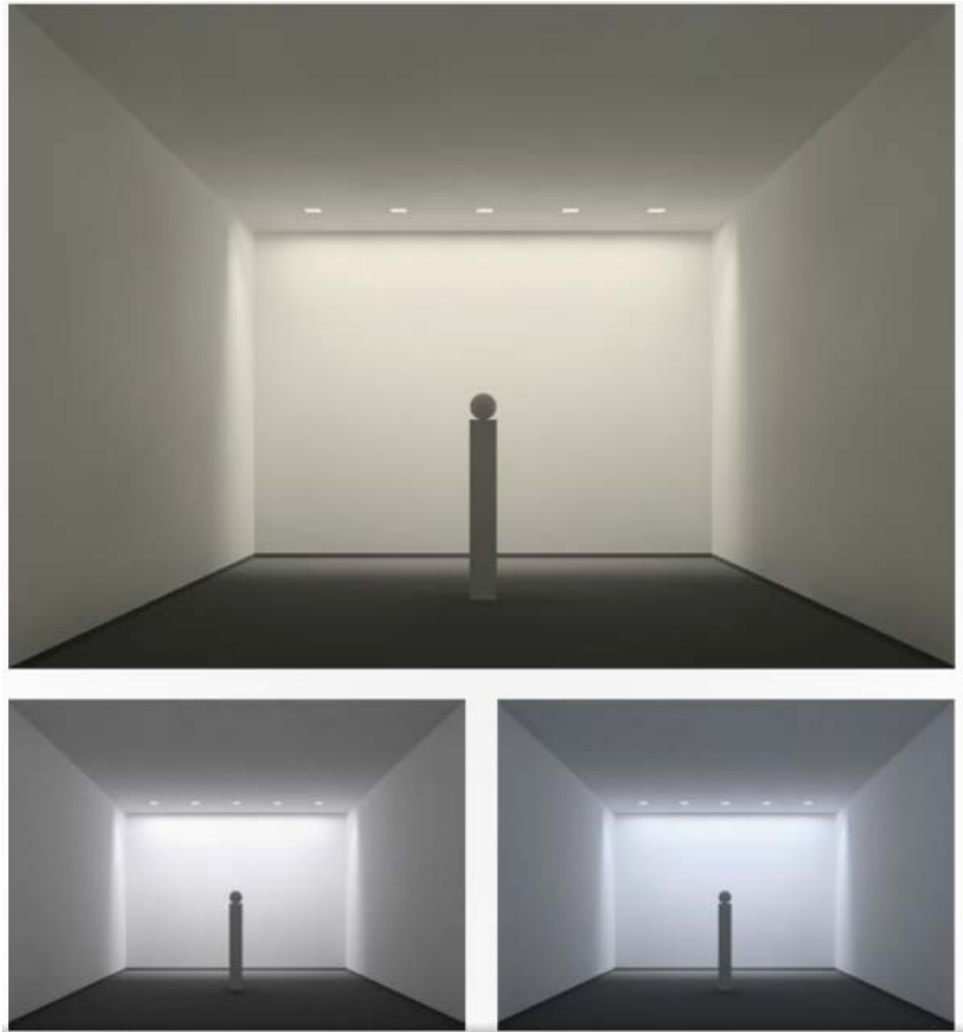

3000K

6000K

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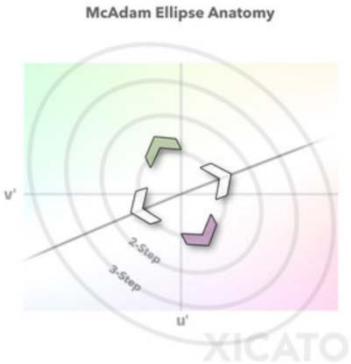
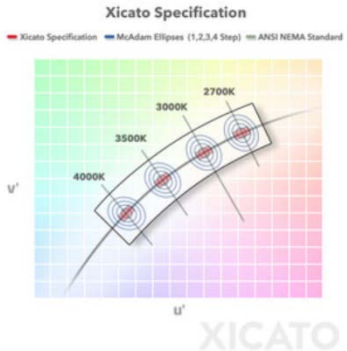
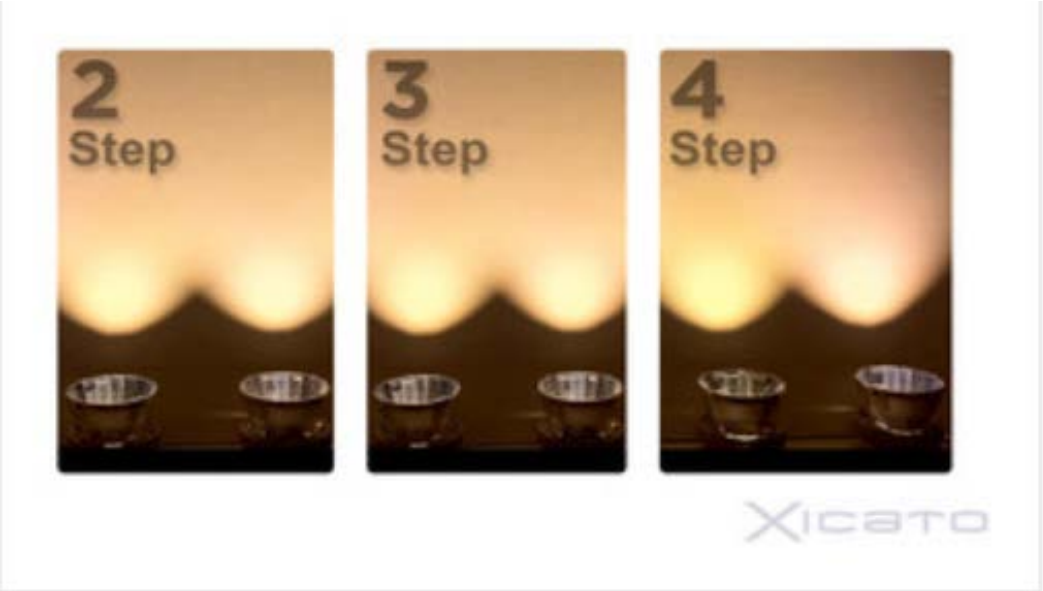
# 色容差


McAdam Ellipse Anatomy
v'
u'
2-Step
3-Step
XICATO


Xicato Specification
Xicato Specification
McAdam Ellipses (1,2,3,4 Step)
ANSI NEMA Standard
2700K
3000K
3500K
4000K
v'
u'
XICATO


2
Step
3
Step
4
Step
XICATO

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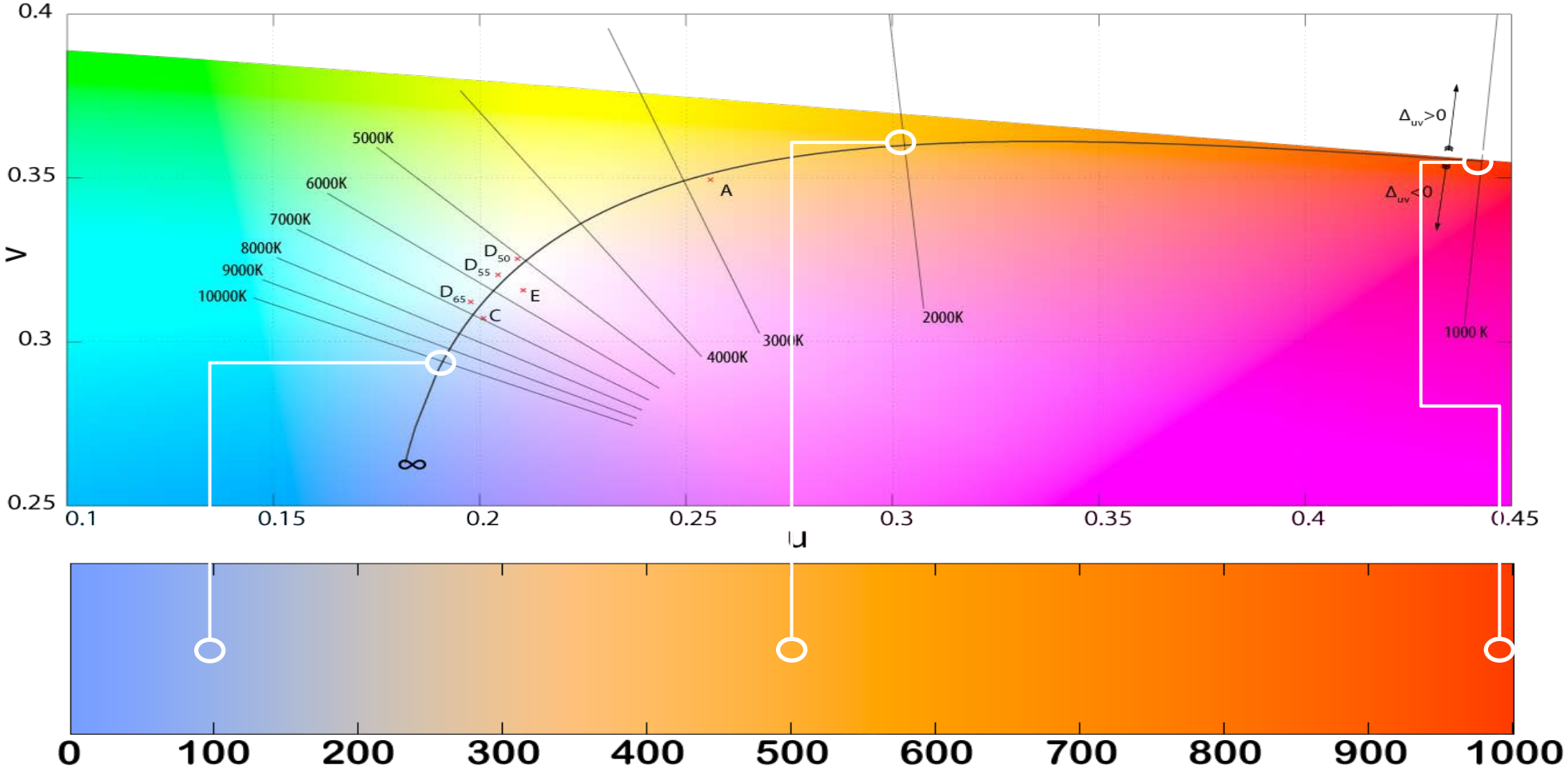
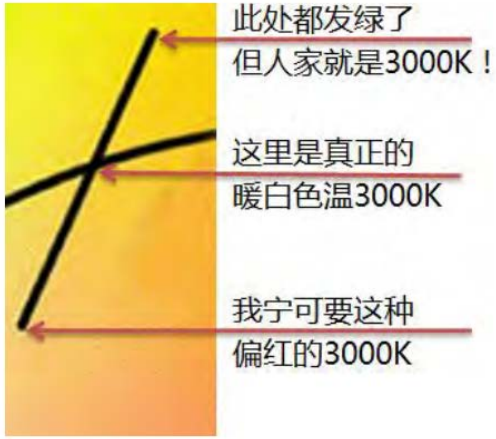
# 普朗克黑体轨迹

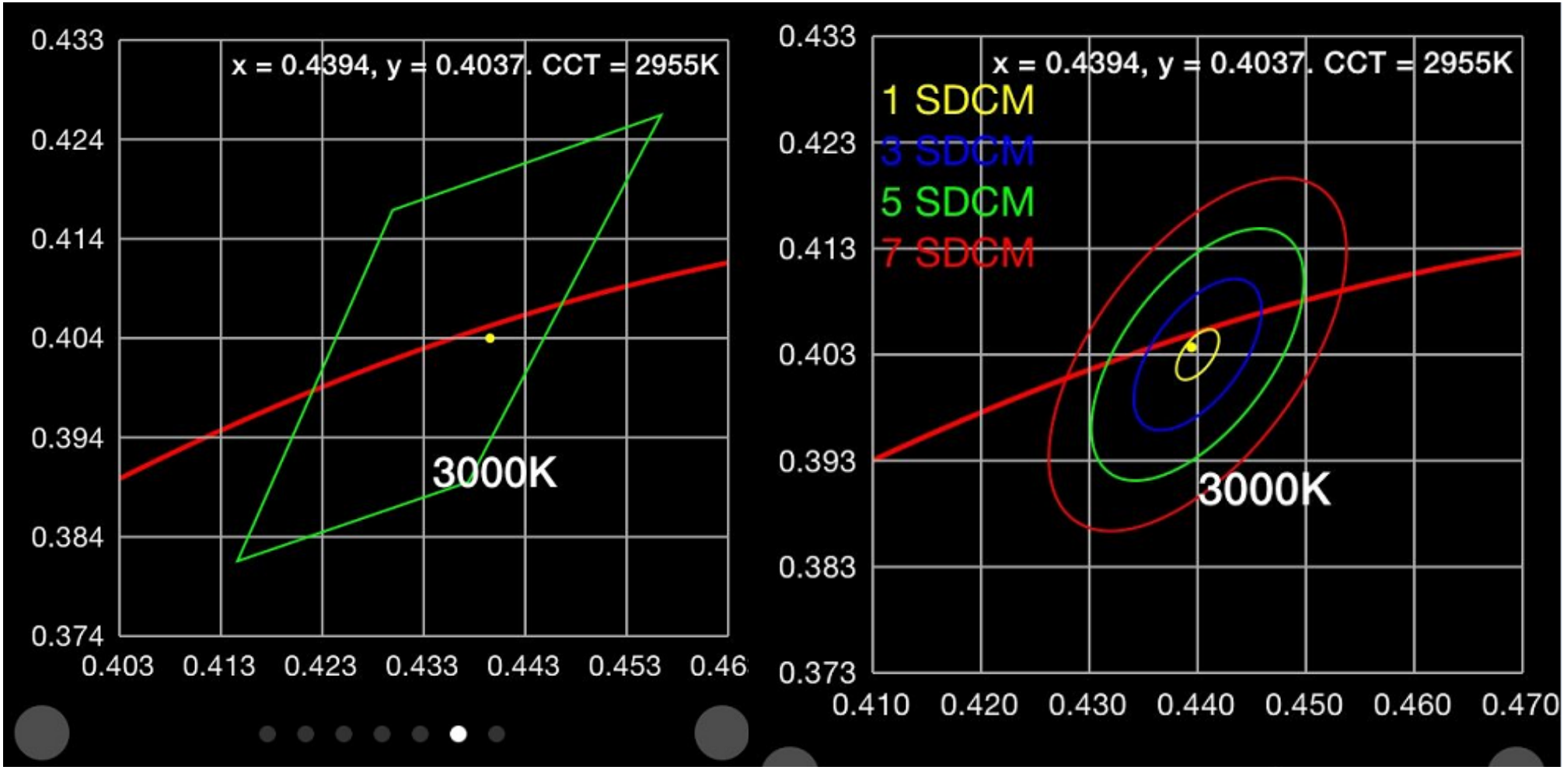


Dengguang.com 38°论坛 汇聚光 品味光



中国联通
下午2:51
16%
返回
Comparison
参数
硬灯条
ENDO
3057 K
相关色温 CCT
3011 K
82
显色指数 CRI
85
78
演色指数Re
80
82
光色品质 CQS
85
6448 lux
光照度
43149 lux
599.0 fc
呎烛光
4008.7 fc

中国联通
下午2:51
16%
返回
Comparison
显色指数 CRI
硬灯条
ENDO
82 R1 85
95 R2 88
93 R3 93
77 R4 86
82 R5 84
92 R6 86
80 R7 88
60 R8 70
14 R9 27
86 R10 73
74 R11 87
72 R12 70
86 R13 85
97 R14 95
77 R15 78
100 75 50 25 0
0 25 50 75 100


x = 0.4394, y = 0.4037. CCT = 2955K
0.433
0.424
0.414
0.404
0.394
0.384
0.374
0.403
0.413
0.423
0.433
0.443
0.453
0.46
3000K
x = 0.4394, y = 0.4037. CCT = 2955K
1 SDCM
3 SDCM
5 SDCM
7 SDCM
0.433
0.423
0.413
0.403
0.393
0.383
0.373
0.410
0.420
0.430
0.440
0.450
0.460
0.470
3000K

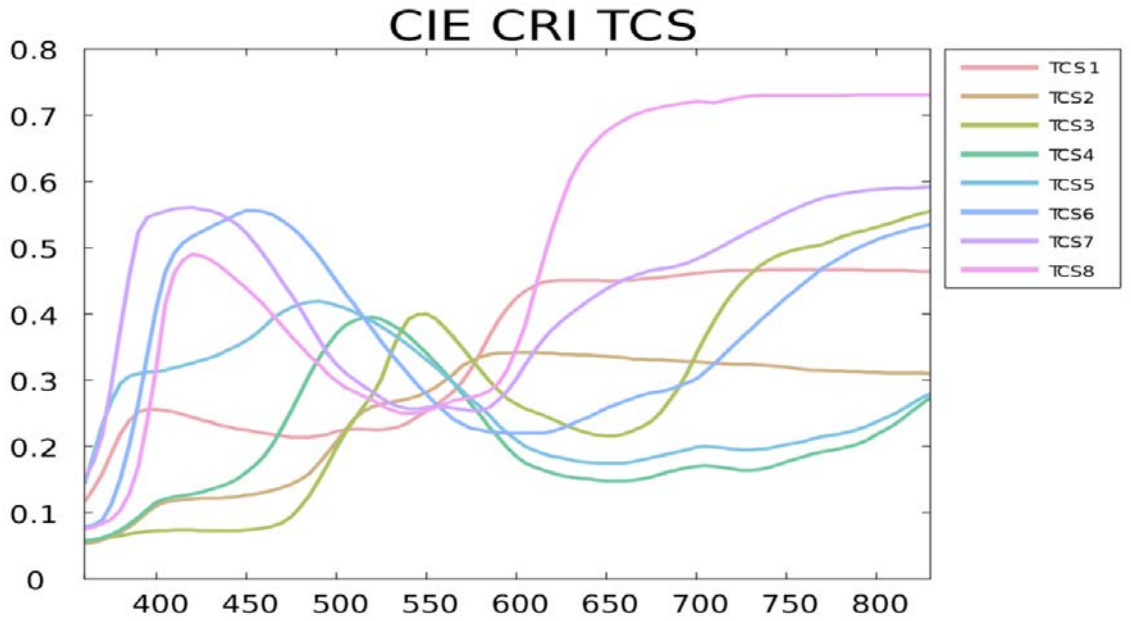
IEC_SDCM
选择色温区间
x = 0.4167, y = 0.3912. CCT = 3265K
1 SDCM
3 SDCM
5 SDCM
7 SDCM
3500K
0.424
0.414
0.404
0.394
0.384
0.374
0.364
0.379
0.389
0.399
0.409
0.419
0.429
0.439

IEC_SDCM
选择色温区间
x = 0.4244, y = 0.4117. CCT = 3282K
1 SDCM
3 SDCM
5 SDCM
7 SDCM
3500K
0.424
0.414
0.404
0.394
0.384
0.374
0.364
0.379
0.389
0.399
0.409
0.419
0.429
0.439

# 显色CRI

- 表示灯光对物体色彩的还原能力
- 显色指数$R_i$与一般显色指数$R_a$

| Name | Appr. Munsell | Appearance under daylight | Swatch |
|---|---|---|---|
| TCS01 | 7,5 R 6/4 | Light greyish red | |
| TCS02 | 5 Y 6/4 | Dark greyish yellow | |
| TCS03 | 5 GY 6/8 | Strong yellow green | |
| TCS04 | 2,5 G 6/6 | Moderate yellowish green | |
| TCS05 | 10 BG 6/4 | Light bluish green | |
| TCS06 | 5 PB 6/8 | Light blue | |
| TCS07 | 2,5 P 6/8 | Light violet | |
| TCS08 | 10 P 6/8 | Light reddish purple | |
| TCS09 | 4,5 R 4/13 | Strong red | |
| TCS10 | 5 Y 8/10 | Strong yellow | |
| TCS11 | 4,5 G 5/8 | Strong green | |
| TCS12 | 3 PB 3/11 | Strong blue | |
| TCS13 | 5 YR 8/4 | Light yellowish pink | |
| TCS14 | 5 GY 4/4 | Moderate olive green (leaf) | |



根据分光辐射亮度计CS—2000测得的光谱分布，我们得到了如下显色指数。利用CS—2000的数据管理软件CS—10w很容易进行计算。

| | Ra | R1 | R2 | R3 | R4 | R5 | R6 | R7 | R8 | R9 | R10 | R11 | R12 | R13 | R14 | R15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D50荧光灯 | 91 | 94 | 91 | 86 | 90 | 93 | 89 | 90 | 90 | 77 | 78 | 93 | 81 | 93 | 92 | 91 |
| 自然白荧光灯 | 79 | 89 | 89 | 54 | 82 | 81 | 72 | 86 | 76 | 16 | 40 | 63 | 55 | 92 | 70 | 92 |
| LED | 68 | 65 | 74 | 79 | 68 | 65 | 62 | 81 | 54 | —39 | 36 | 61 | 31 | 66 | 88 | 59 |

Ra表示“平均显色指数”。它是指数R1~R8的平均值，也是显色指数的典型值。R9~R15称为“特殊显色指数”，尤其是R9（深色鲜红）和R15（中国人的肤色）。

R9是评价红色复现质量的指标，而三种类型光源的R9值相差很大，由于LED光源的R9显色指数很低，甚至为负，使肉和盘子看起来比较昏暗。

国际照明委员会（CIE）一般把显色指数分成五类：

类别 Ra 适用范围

1．A ＞90 美术馆、博物馆及印刷等行业及场所

2．B 80—90 家庭、饭馆、高级纺织工艺及相近行业

2．60—80 办公室、学校、室外街道照明

3．40—60 重工业工厂、室外街道照明

4．20—40 室外道路照明及一些要求不高的地方

Ra只取了8个色板的“成绩”，而Re取了14块色板，最新的Rf、Rg体系，100多块色板

# 显色CRI

STAEDTLER
triplus® fineliner

STAEDTLER
triplus® fineliner

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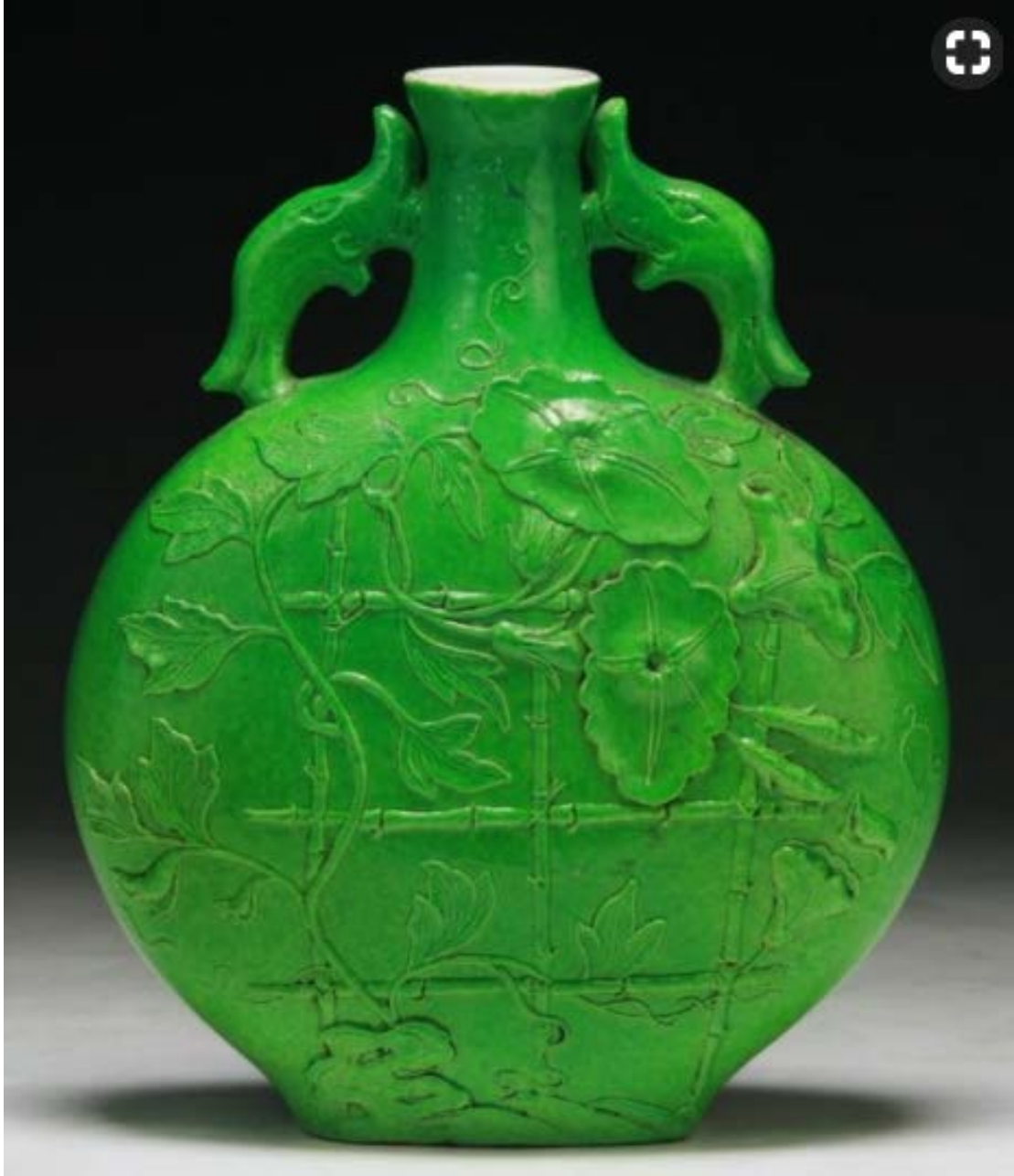

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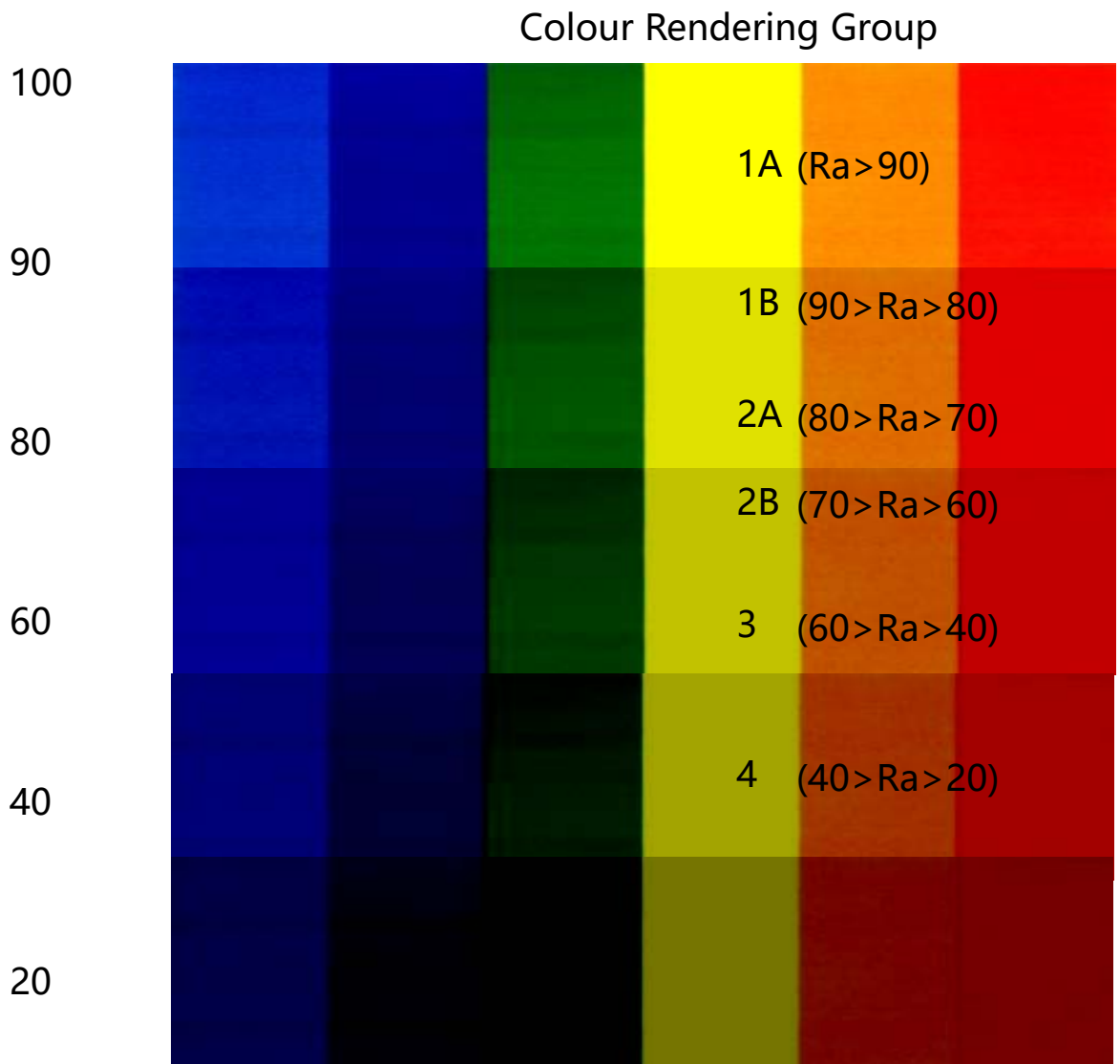


Typical application

Accurate
*Medical examination, colour printing inspection, art galleries etc.*

Good
*Retail, Showrooms, Restaurants, Offices etc.*

Moderate
*Offices, Classrooms, Security Lighting, Supermarkets, Manu. Areas, etc.*

Poor
*Street Lighting, Parking Areas, etc.*

Not Important
*Street Lighting*

Beacon LED
CRI > 93

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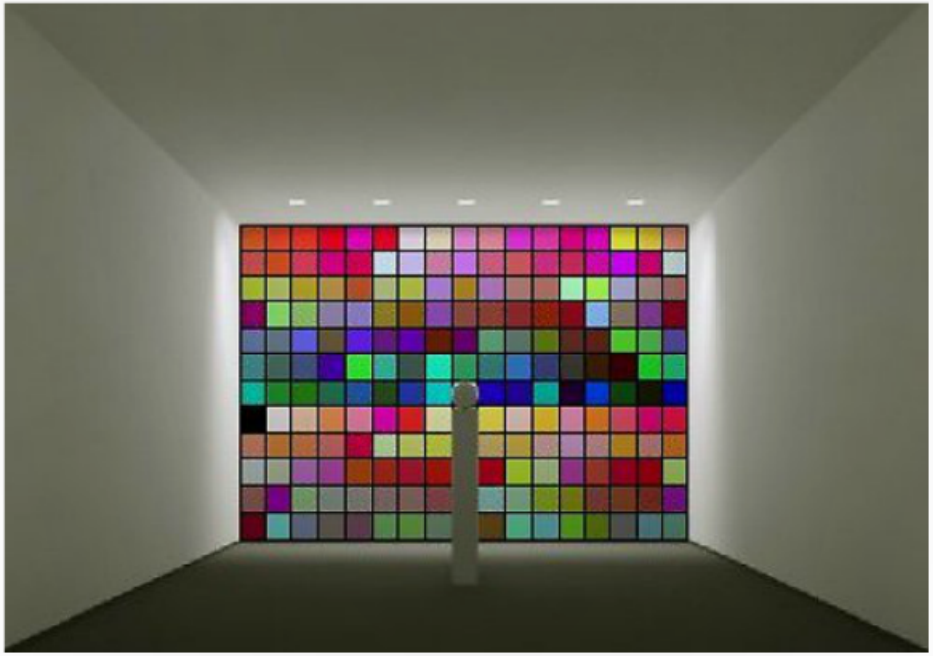
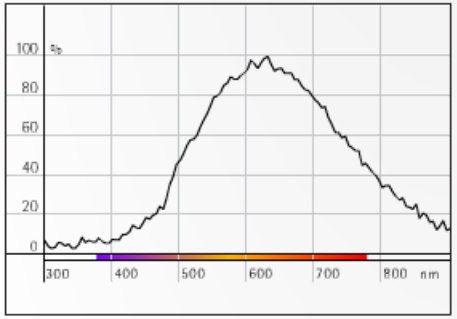


The quality of the reproduction of colours is termed colour rendition. Linear spectra have a very good colour rendition. Linear spectra only permit one single colour to be perceived well. Multiline spectra reproduce several colours of the relevant spectrum well, but in the intermediate areas the colour rendition is weaker. Blue and green colours appear comparatively grey and matt under warm white incandescent light despite excellent colour rendition. However, these hues appear clear and bright under daylight white light from fluorescent lamps – despite poorer colour rendition. When rendering yellow and red hues, this phenomenon of respective weakening and intensifying of the chromatic effect is reversed.




**Incandescent lamp**
Continuous spectra lead to good colour rendition. Incandescent lamps or daylight have the colour rendition index Ra 100.

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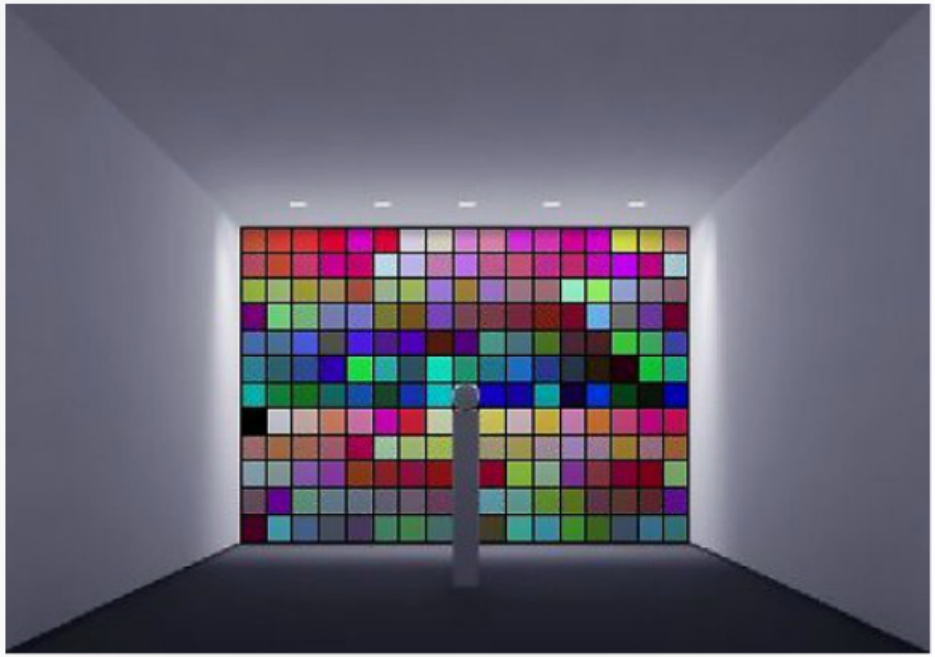
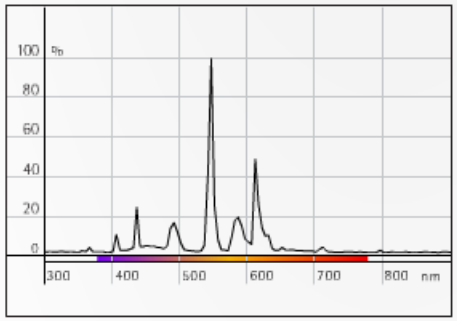


Because the eye is able to adapt to light of the most different colour temperatures, the colour rendition must be determined dependent on the colour temperature. Tungsten halogen lamps feature very good colour rendition. The rendition quality of fluorescent lamps and metal halide lamps ranges from good to average. The degree of colour distortion against a reference light source is indicated using the colour rendition index Ra or the colour rendition grading system. The colour rendition index is only used for white colours of light.




**Fluorescent lamp**
Discharge lamps such as fluorescent lamps or metal halide lamps feature a multiline spectrum. Their colour rendition is therefore lower than Ra 100.

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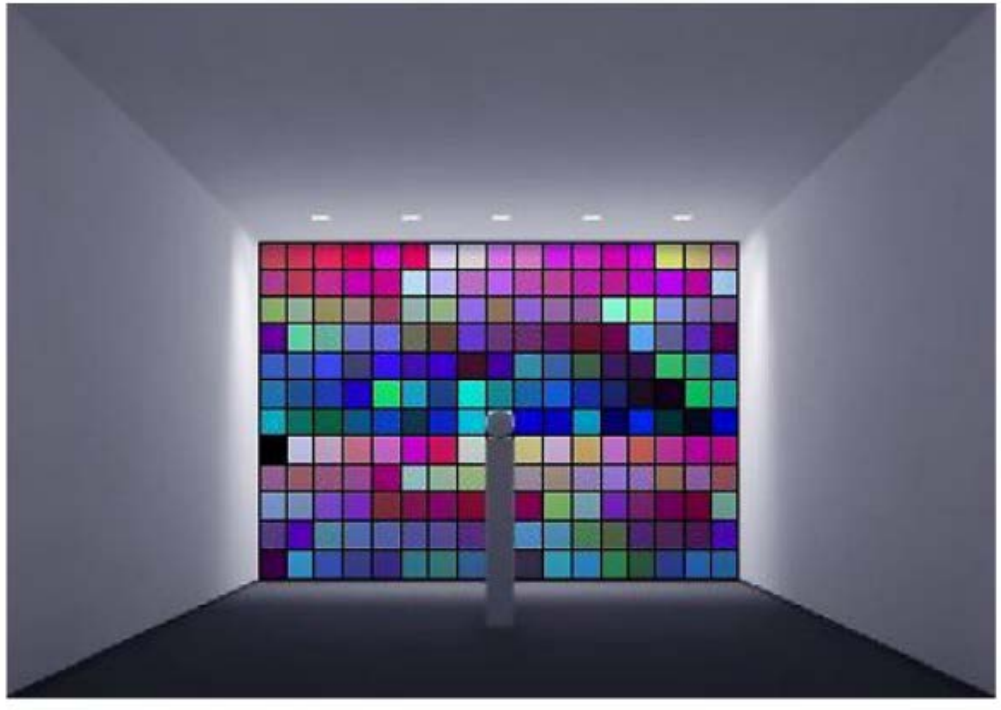

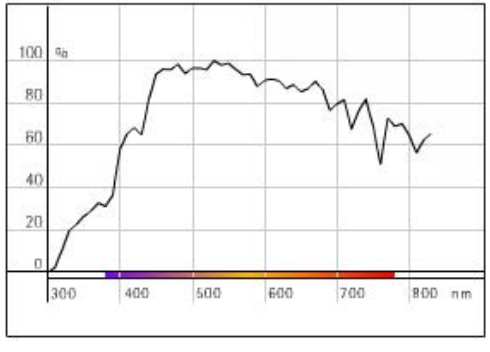


**Daylight**
Continuous spectra lead to good colour rendition. Incandescent lamps or daylight have the colour rendition index Ra 100.

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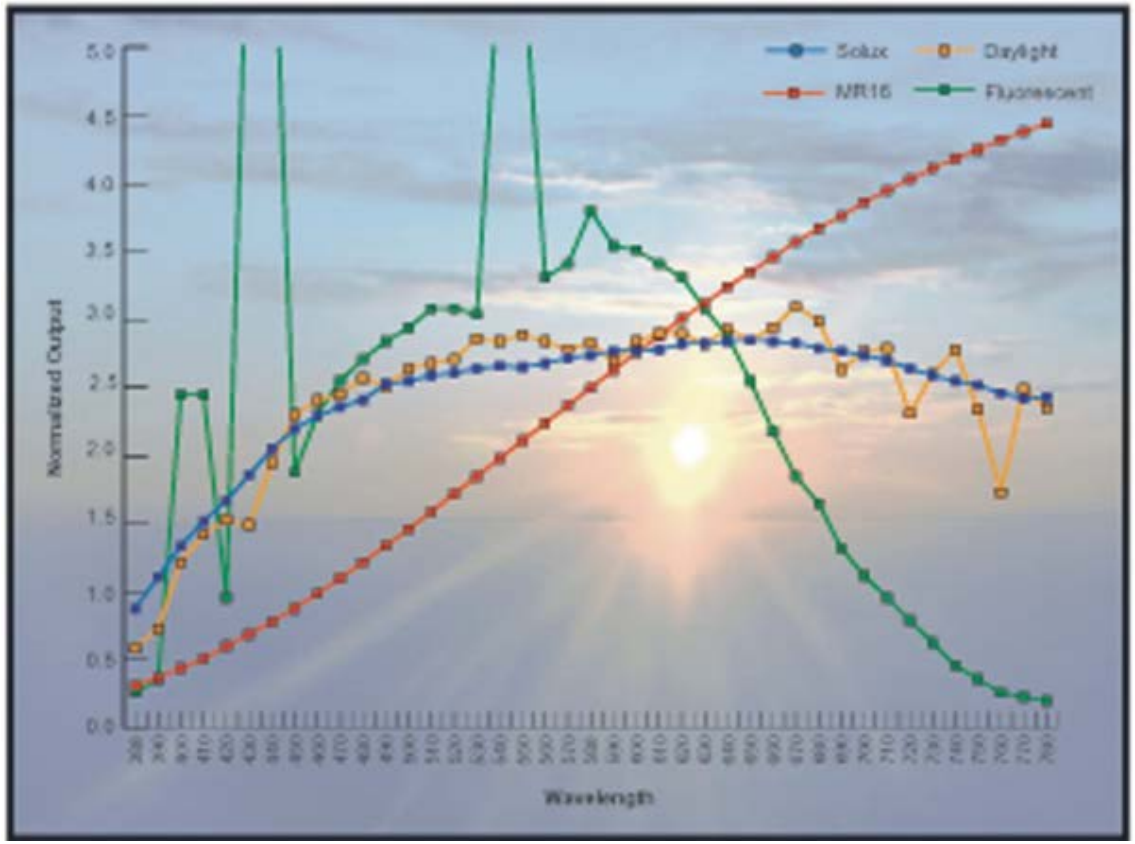
# 光譜曲綫分布



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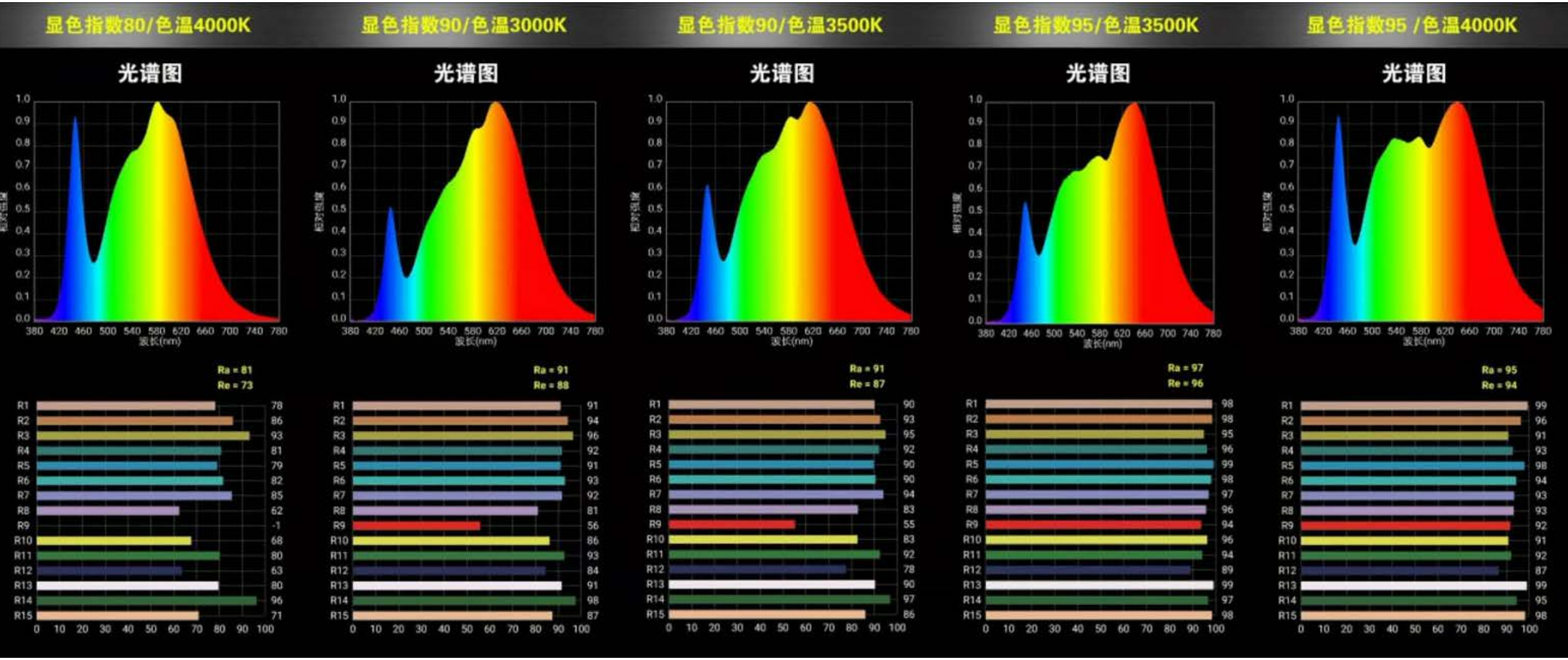


试验是设计的基础。

“鸟巢”的夜景照明系统的建设前后历时二年，在这个过程中凝聚了国内外著名专家，设计团队及施工管理者的智慧与心血，其间攻克了“红墙色彩还原和照度均匀度”、“钢结构均匀度与眩光控制之间的平衡”等技术难题。

2006年12月，根据ARUP的设计方案建场建模，按照1:1的比例做了大量的试验。采用数十种灯具的不同组合，分别记录照度分布、均匀度、分布梯度，眩光，光色等等指标参数，形成自己的初步实施方案。

2007年5月，根据初步实施方案，在鸟巢工地现场选取标准段进行实验。发现并解决了大量技术问题，但由于建筑红墙的材质表面处理有了变动，凸现了光色还原和眩光问题。设计团队进一步修改完善方案。

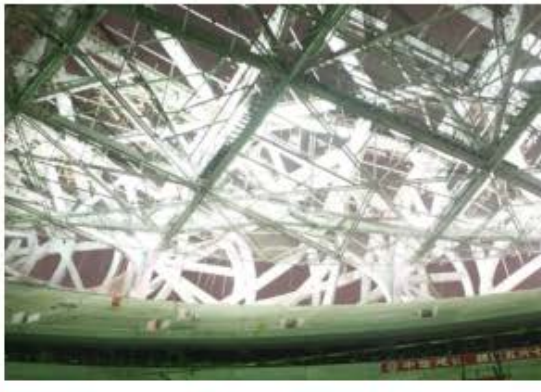
2007年8月起开始实施，经八个月鏖战，工程安装调试完毕。

2008年3月，根据有关领导及业主方提出对原设计方案升级的意见，经海内外数十位照明专家，艺术家对升级方案作广泛深入的论证，确定增加动态效果和金色场景的方案，并充分考虑节能和器材的再利用。

2008年5月，升级方案开始实施，在短短一个月内实施完毕，经过数次预演，连调，国家体育场夜景照明完美问世。

2008年7月16日，鸟巢夜景照明正式亮相，与奥运会开幕式同时彩排。

1 立面和转架效果试验
2 看台背板照明试验
3 荧光灯洗墙试验
4 星顶照明试验
5 1:1模型实验测试
6 LED眩光光色试验



绿光

红光

黄光

高色温

中色温

低色温

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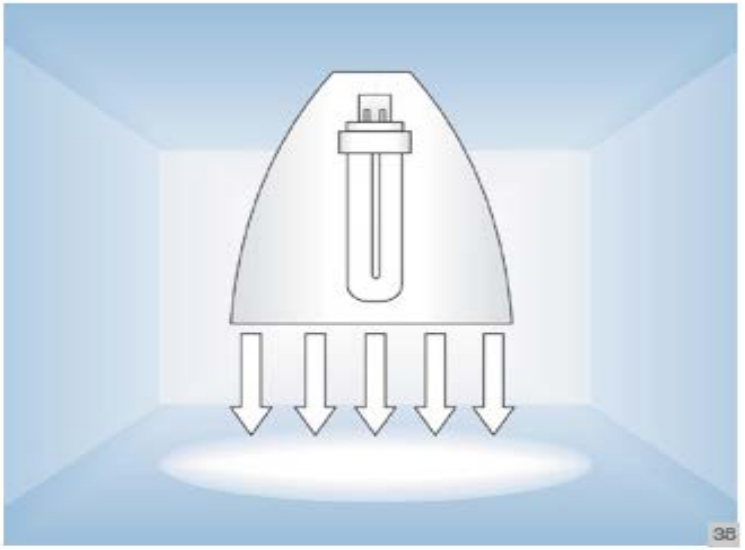
# 照度

- 照度表示一定面积上光通量的多少
- E
- $lm/m^2$，lx
- 水平照度$E_h$
- 垂直照度$E_v$
- 倾斜面曲面的问题



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# 照度

**表 5.3.8-1 美术馆建筑照明标准值**

| 房间或场所 | 参考平面及其高度 | 照度标准值(lx) | UGR | $U_0$ | $R_a$ |
|---|---|---|---|---|---|
| 会议报告厅 | 0.75m 水平面 | 300 | 22 | 0.60 | 80 |
| 休息厅 | 0.75m 水平面 | 150 | 22 | 0.40 | 80 |
| 美术品售卖 | 0.75m 水平面 | 300 | 19 | 0.60 | 80 |
| 公共大厅 | 地 面 | 200 | 22 | 0.40 | 80 |
| 绘画展厅 | 地 面 | 100 | 19 | 0.60 | 80 |
| 雕塑展厅 | 地 面 | 150 | 19 | 0.60 | 80 |
| 藏画库 | 地 面 | 150 | 22 | 0.60 | 80 |
| 藏画修理 | 0.75m 水平面 | 500 | 19 | 0.70 | 90 |

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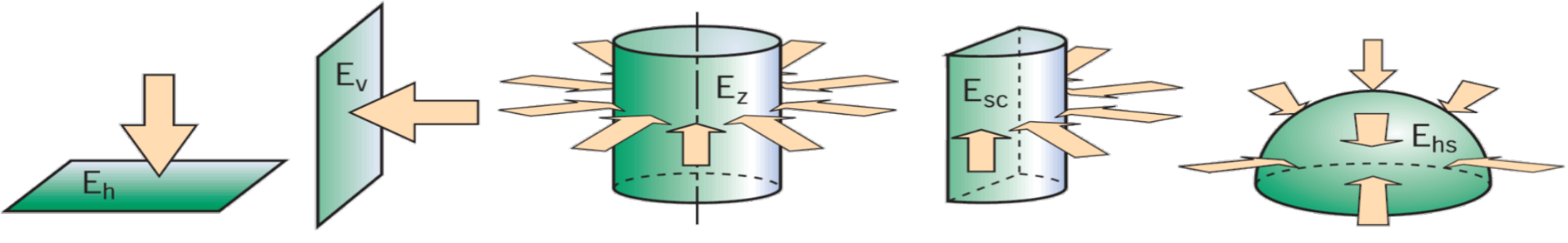
# 照度的类型




- 水平照度 垂直照度 柱面照度 半柱面照度 球面照度

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# 照度计

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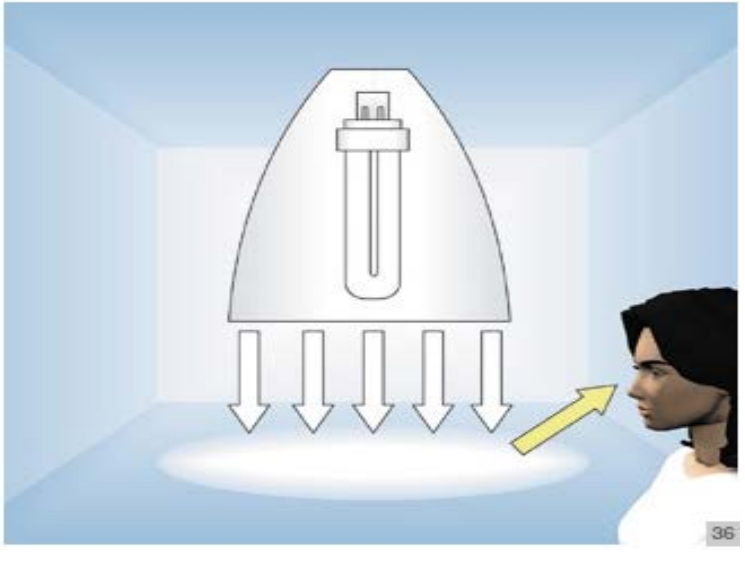
# 亮度

- 亮度表示被照面或发光面的被人眼感知到的明亮程度
- L
- $cd/m^2$
- 完全漫射时，
- $L=\rho E/\pi$



漆
うるし
Lacquer

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# 展览照明设计手法

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# 灯带（线条灯）洗墙

增加层次感，提供环境照明，降低亮度比

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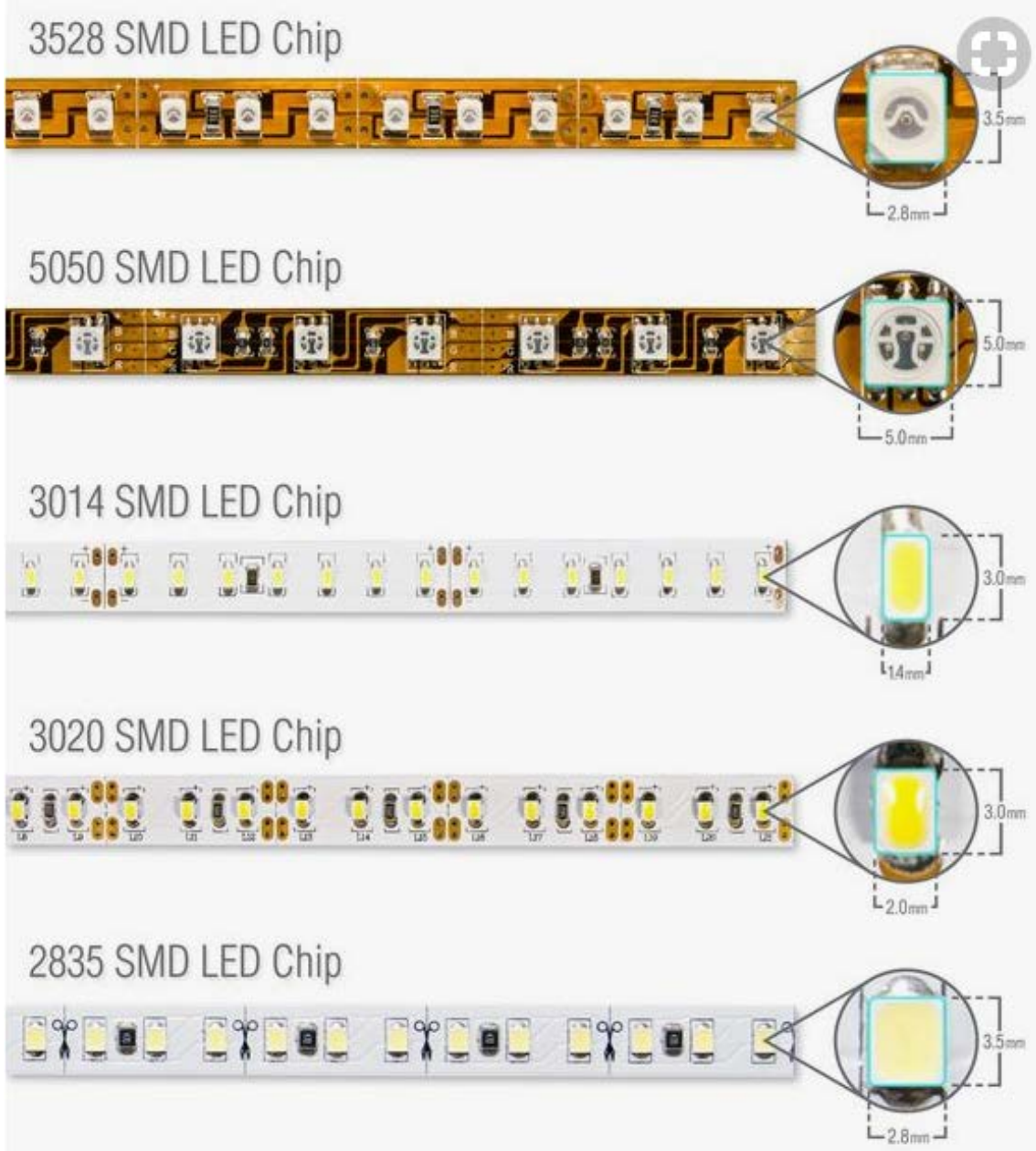

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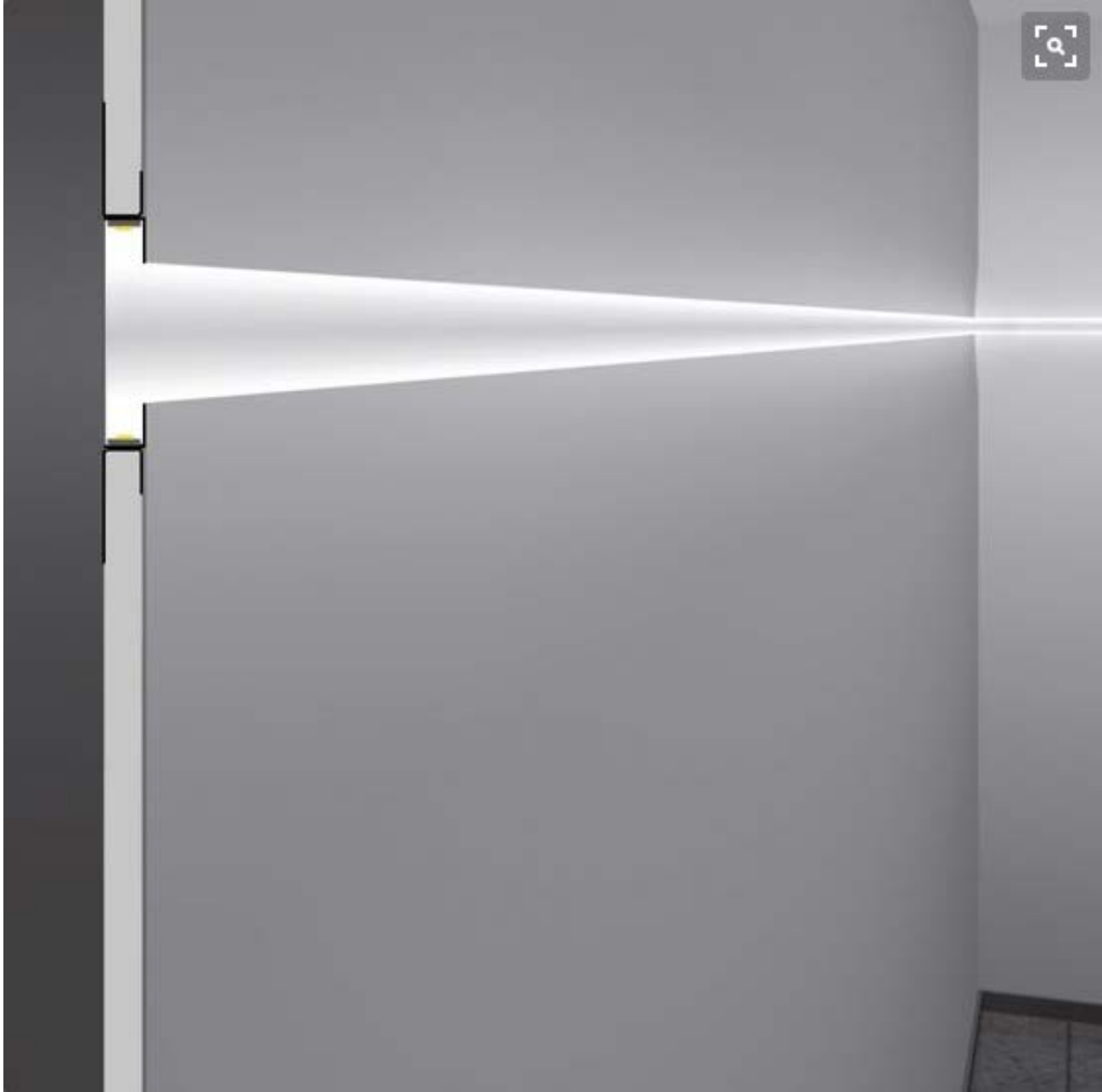

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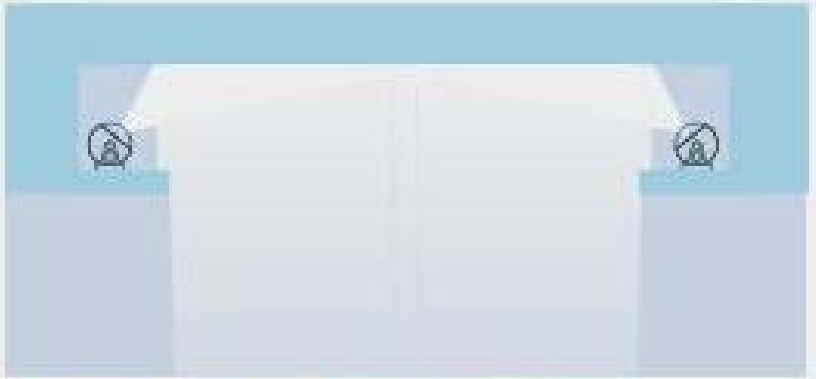
Ceiling illumination from perimeter cove at top of wall



Ceiling illumination from a center cove

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**Wall illumination from perimeter cove at edge of ceiling**

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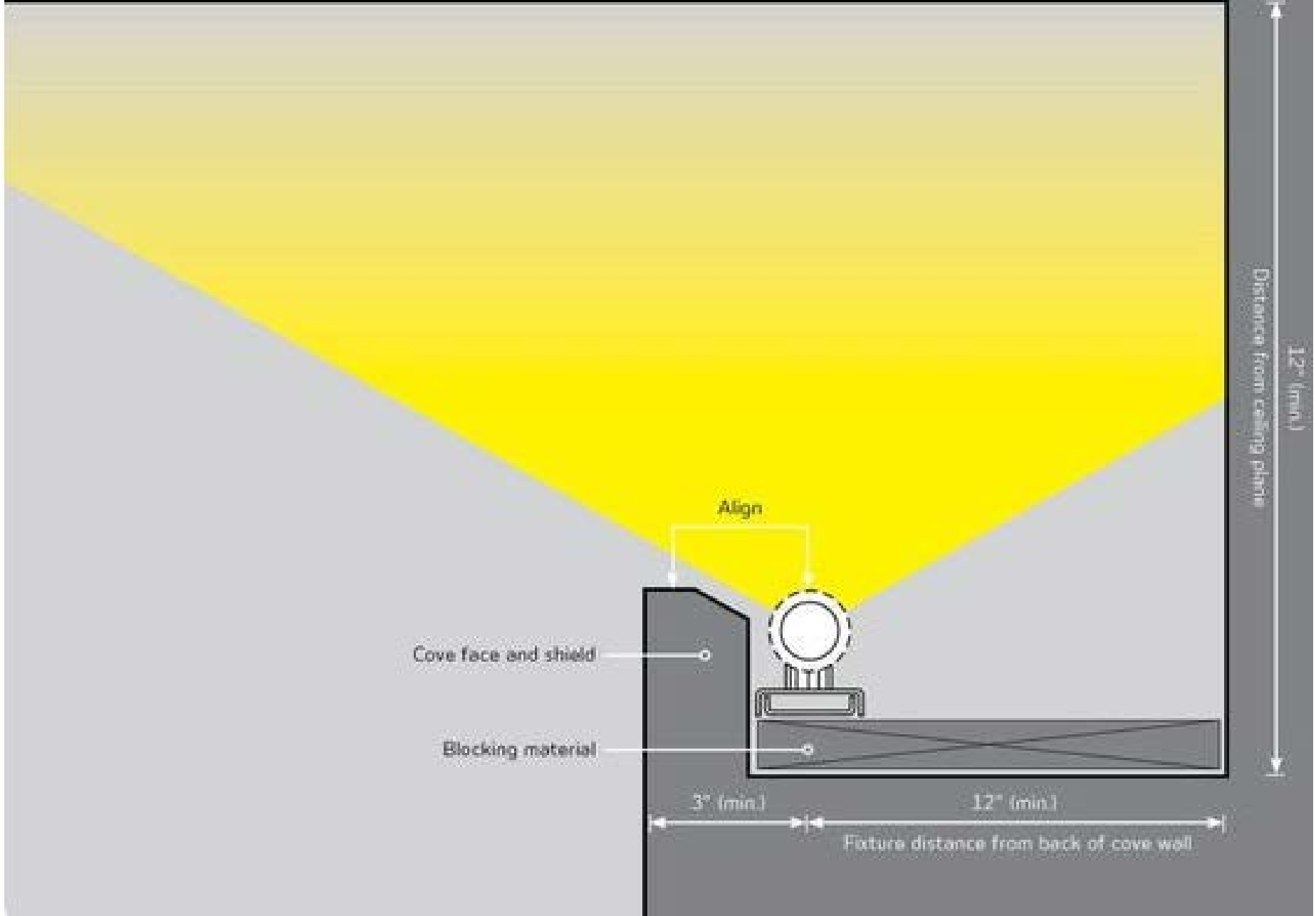

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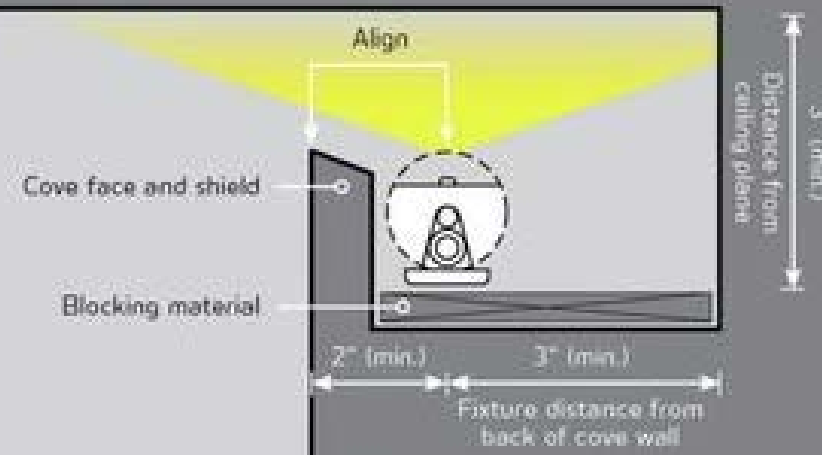


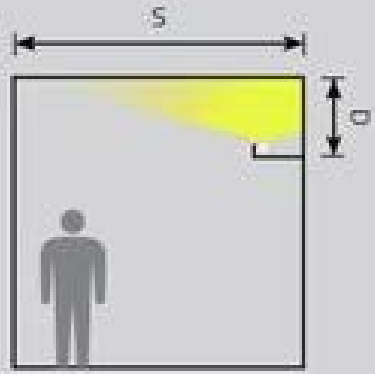


S = Ceiling span
D = Cove distance from ceiling

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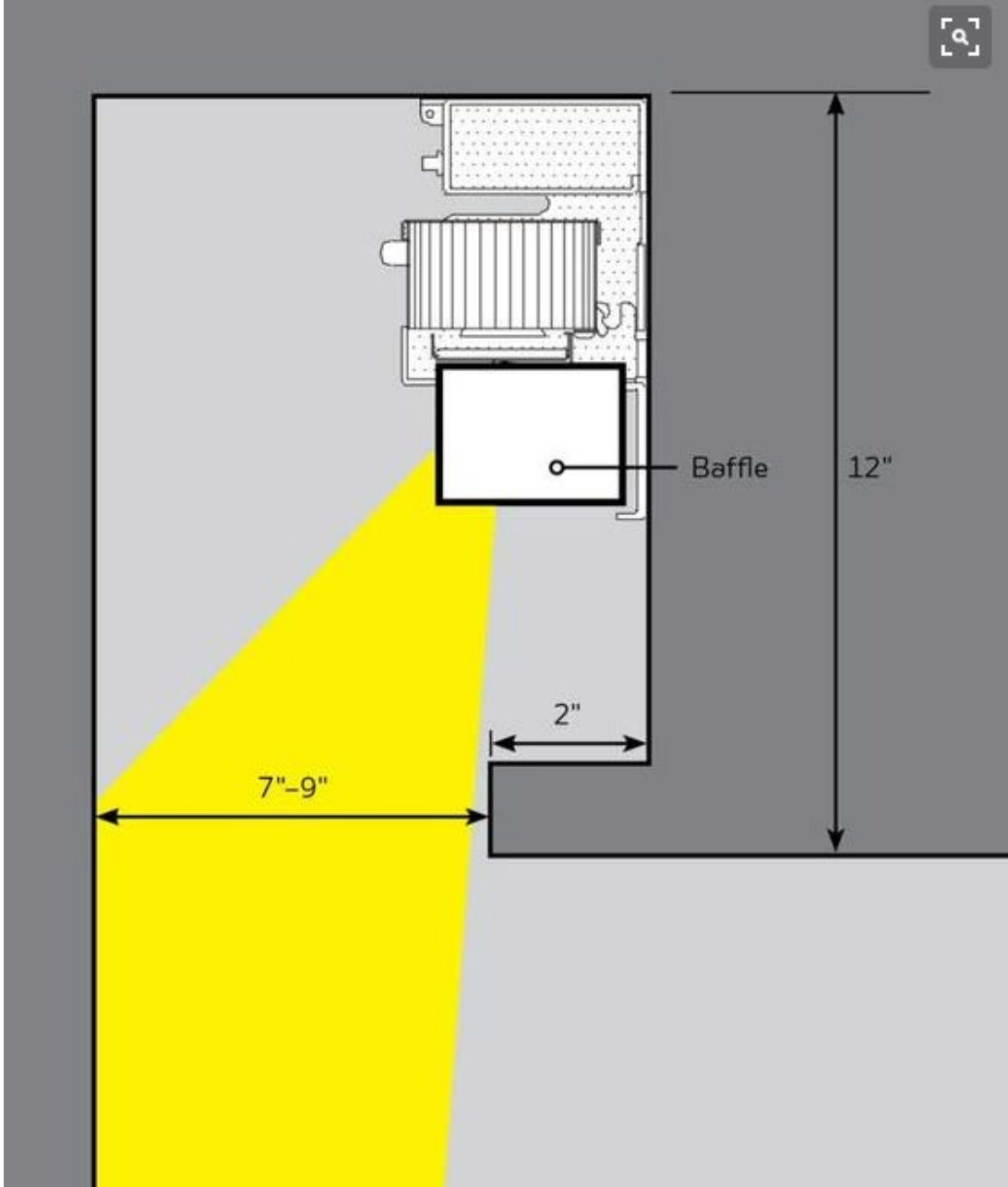

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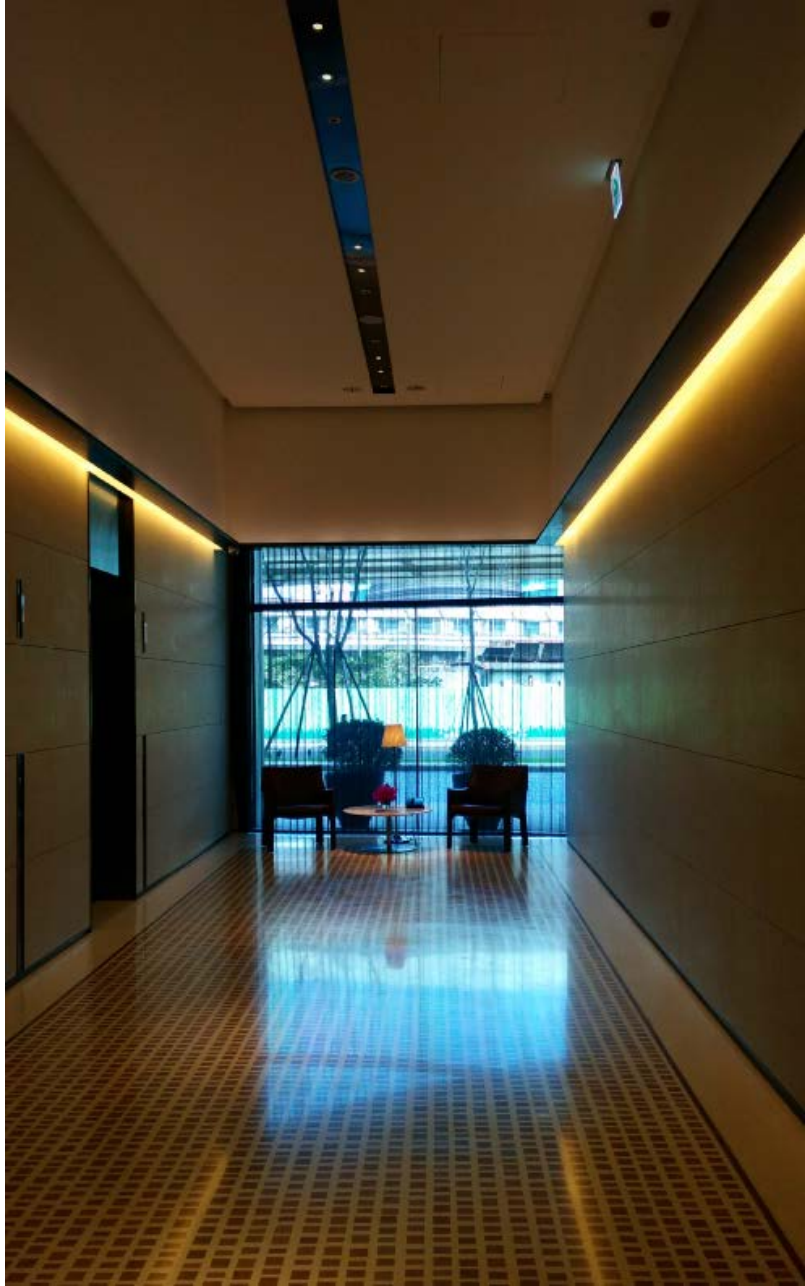

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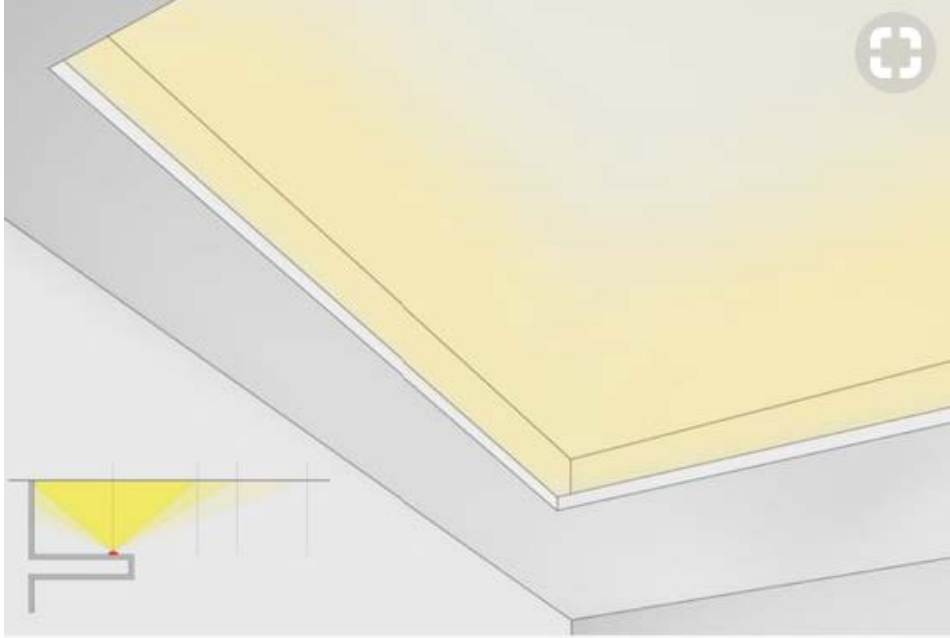

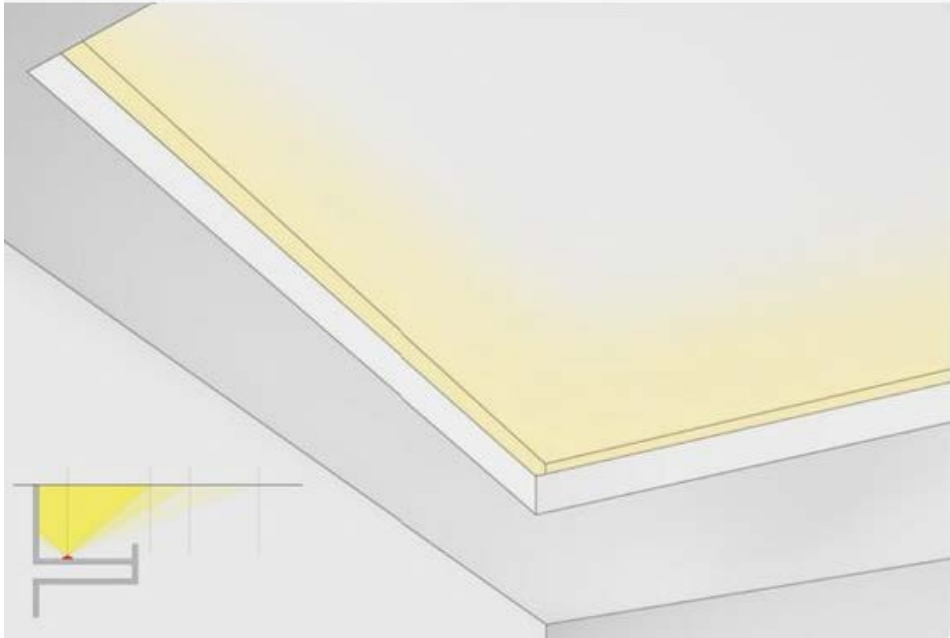

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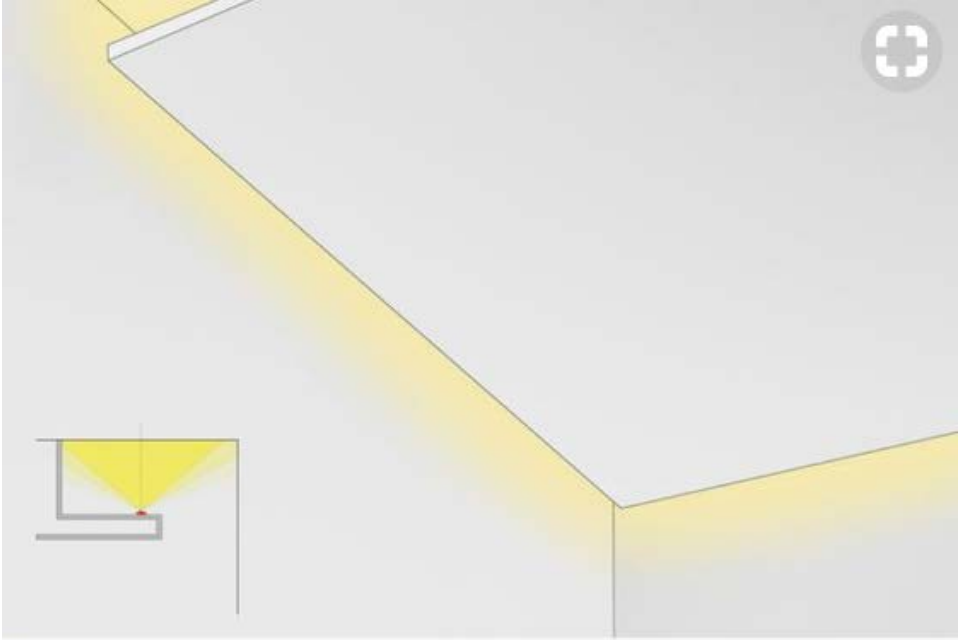

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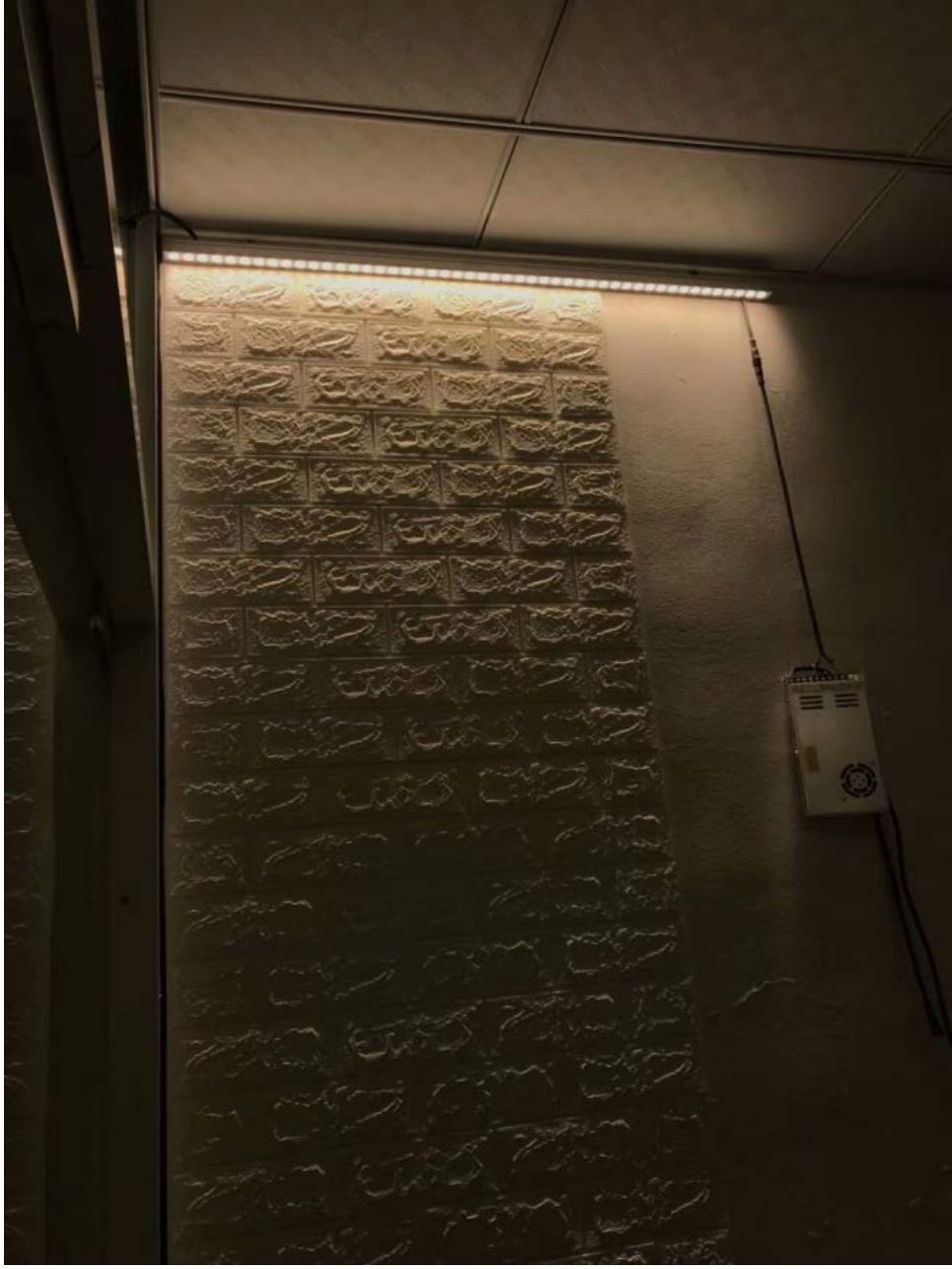

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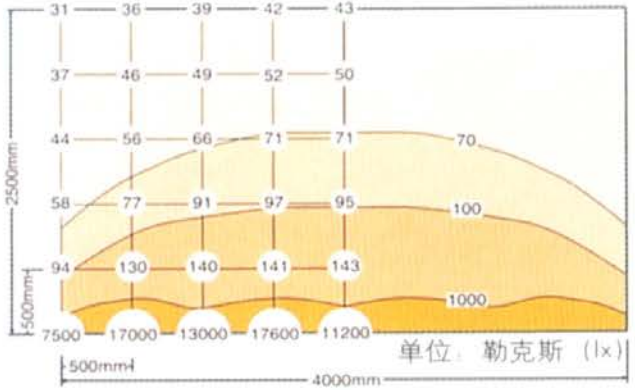
# - 光源与受光面之间的距离

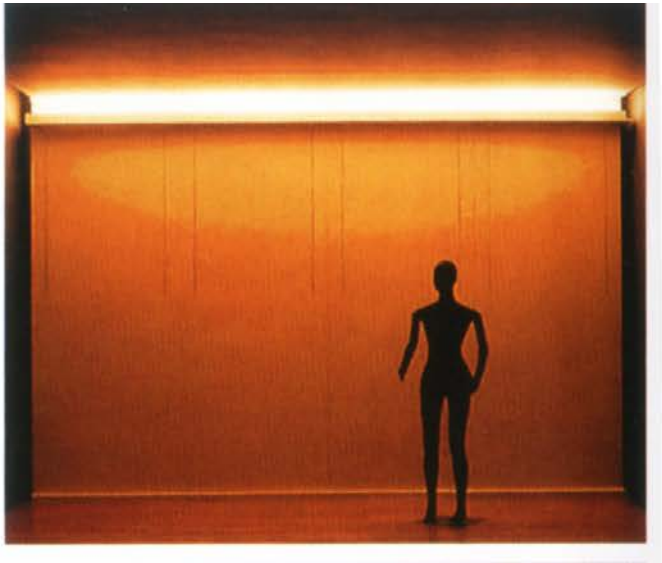
## 改变光源与天花板的距离

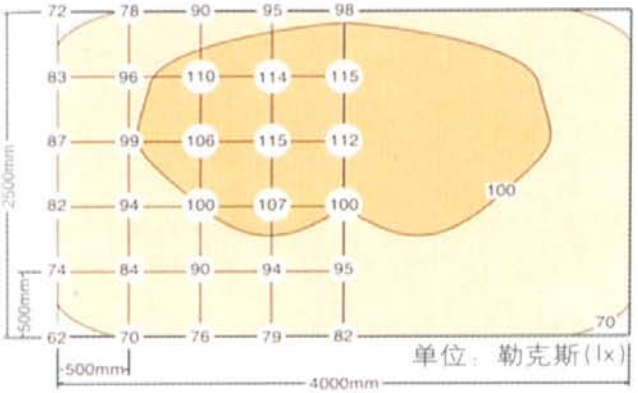
光源与墙面的间隙保持70mm的距离；

光源与天花板之间的距离为150mm。




天花照度分布





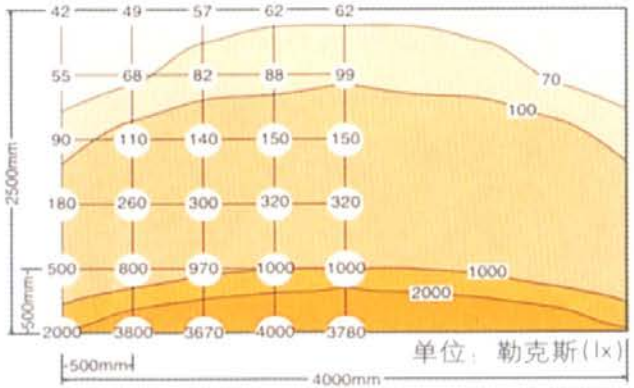

地面照度分布

# - 光源与受光面之间的距离

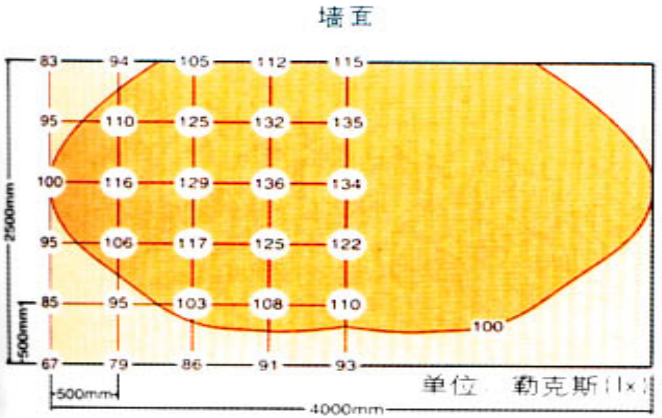
## 改变光源与天花板的距离

光源与墙面的间隙保持70mm的距离；

光源与天花板之间的距离为300mm。




天花照度分布



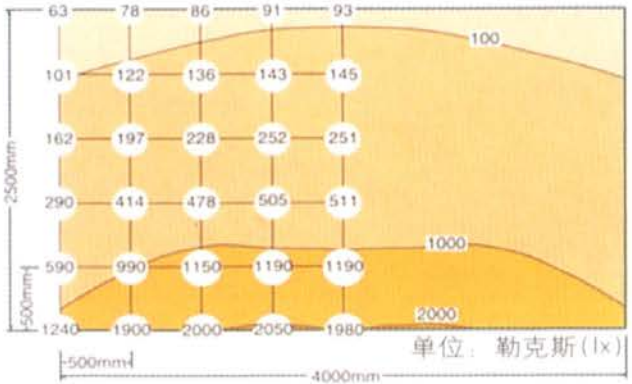

地面照度分布

# - 光源与受光面之间的距离

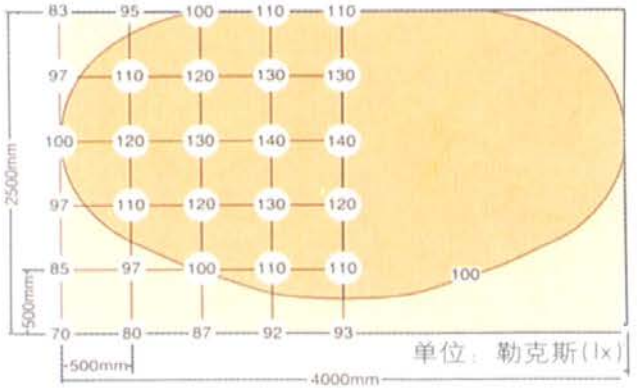
## 改变光源与天花板的距离

光源与墙面的间隙保持70mm的距离；

光源与天花板之间的距离为500mm。




天花照度分布

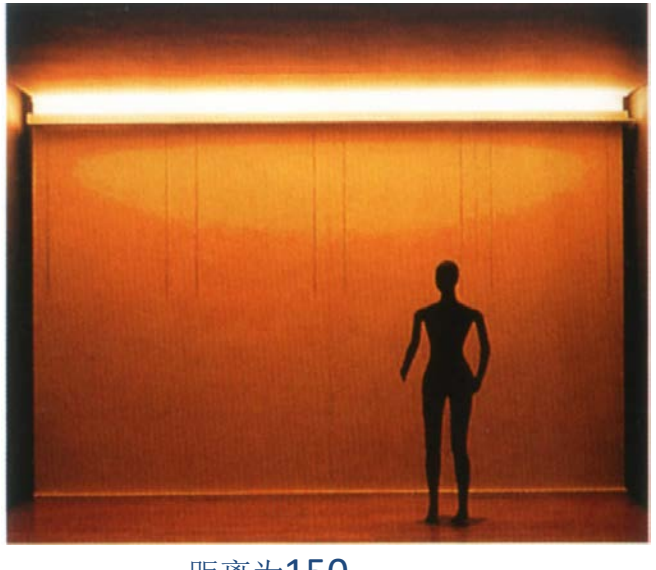



地面照度分布

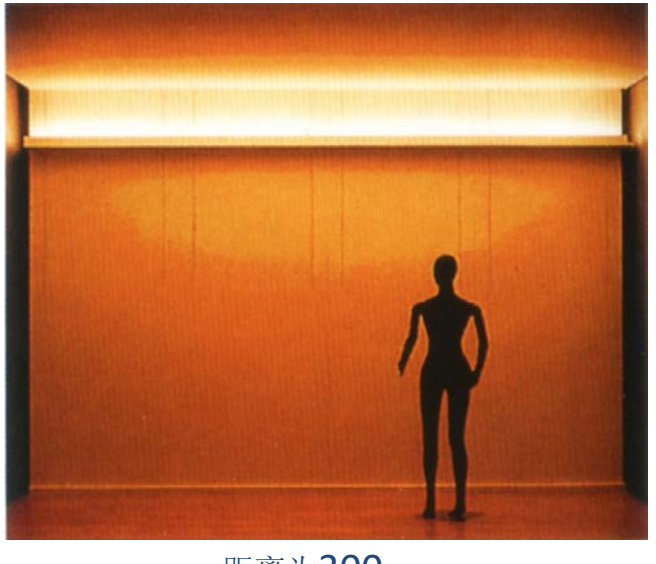
# - 光源与受光面之间的距离

## 改变光源与天花板的距离

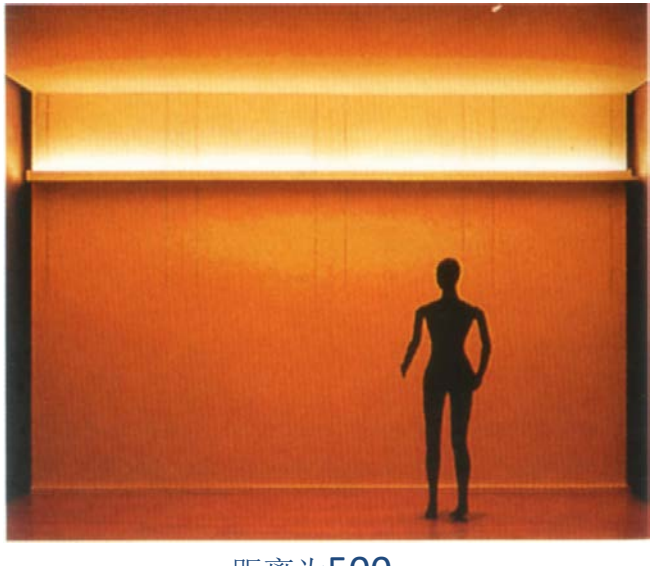
光源和天花板之间的间隙变化对视觉和照明效果产生很大影响。但如果将光源的位置放的太向下就会产生离光源近的墙面光照过强的效果。在采用平顶天花板发光灯槽照明时，光源和天花板的间隙通常在300㎜以上500㎜以下。



距离为150 mm



距离为300 mm



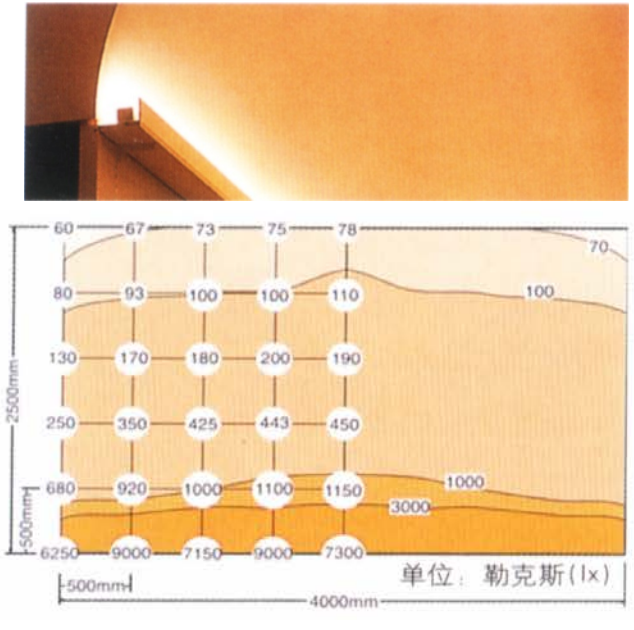
距离为500 mm

# - 光源与受光面之间的距离

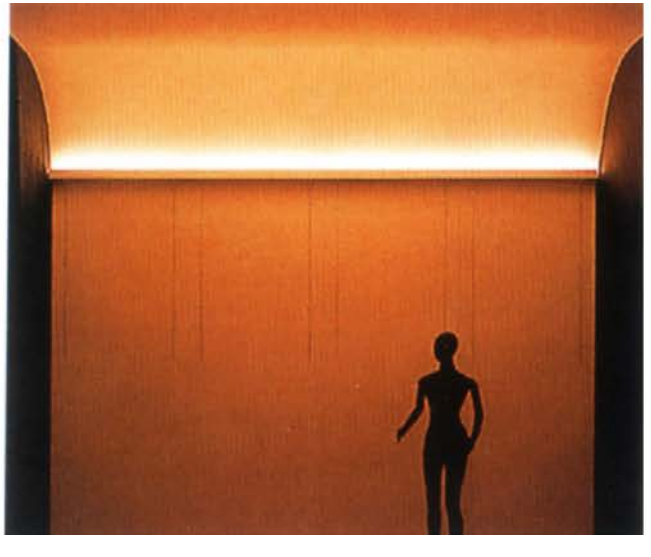
## 改变光源与墙面的距离

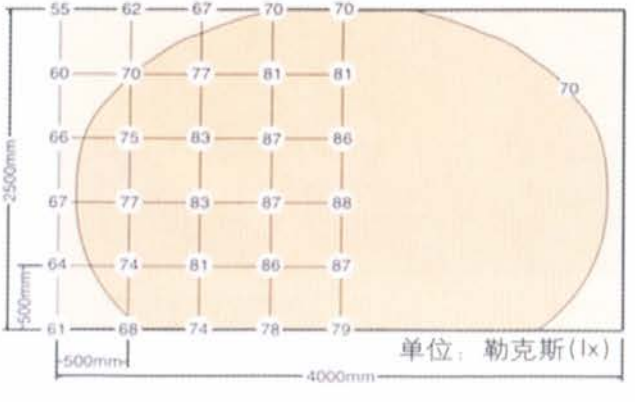
光源与天花板的间隙保持不变；

光源与墙面之间的距离为50mm。




天花照度分布





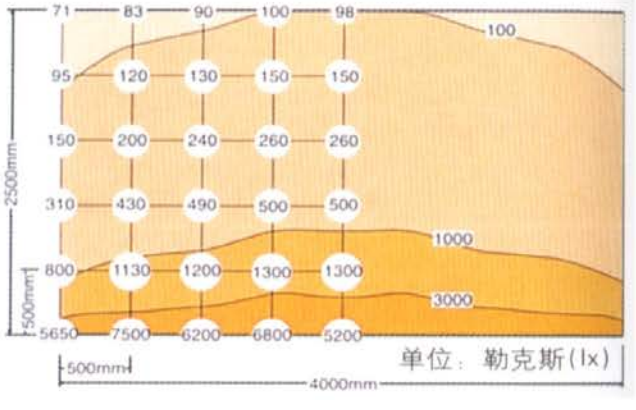

地面照度分布

# - 光源与受光面之间的距离

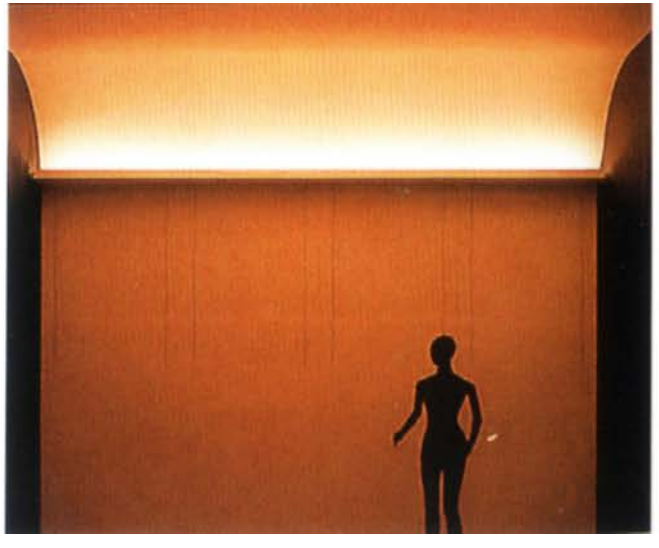
## 改变光源与墙面的距离

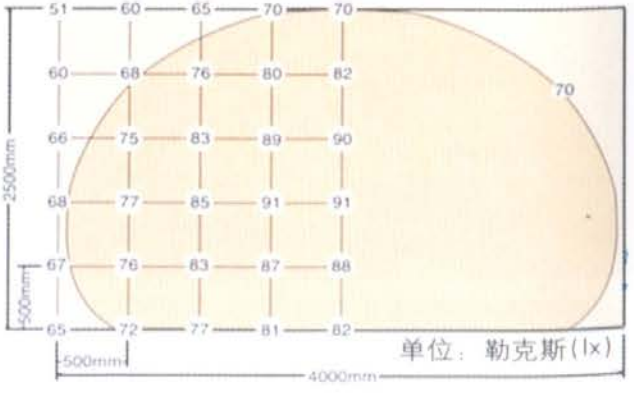
光源与天花板的间隙保持不变；

光源与墙面之间的距离为200mm。




天花照度分布





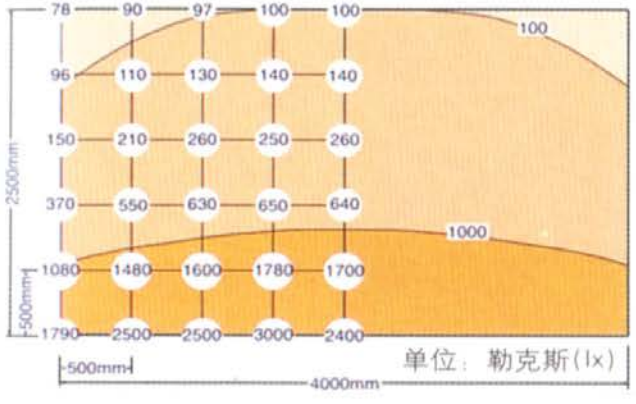

地面照度分布

# - 光源与受光面之间的距离

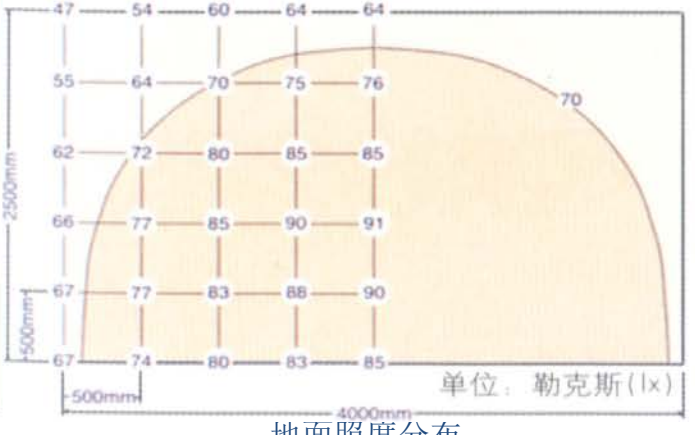
## 改变光源与墙面的距离

光源与天花板的间隙保持不变；

光源与墙面之间的距离为350mm。




天花照度分布

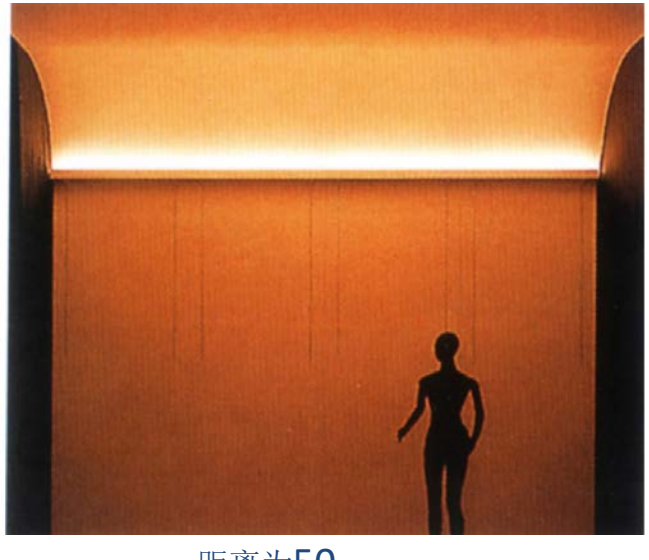



地面照度分布

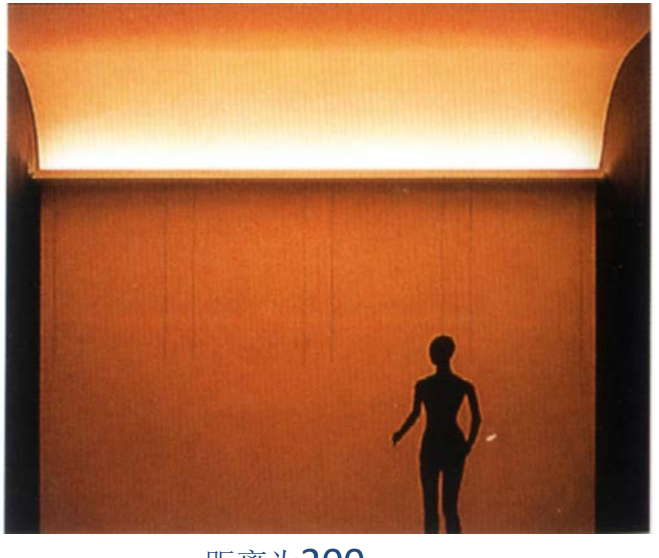
# - 光源与受光面之间的距离

## 改变光源与墙面的距离

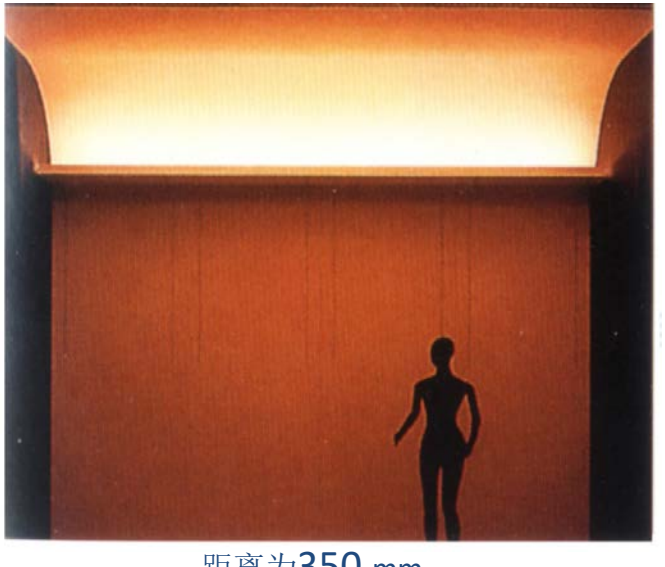
光源与墙面之间的间隙变换对视觉和效果会产生很大影响。间隙过小，会产生强烈的反差，间隙越大，光的层次越柔和。因此，对于圆弧型天花板的发光灯槽来说，光源与墙面的间隙应在200㎜以上。



距离为50 mm



距离为200 mm



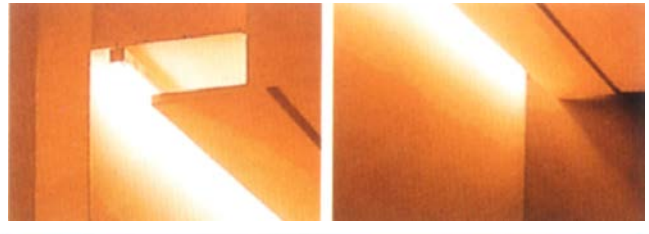
距离为350 mm

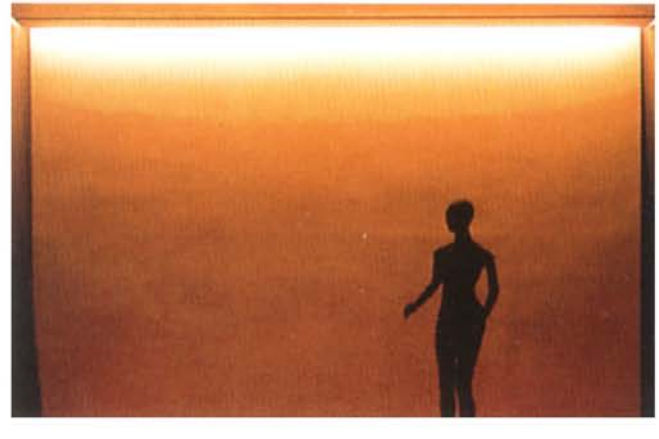
# - 光源的遮光位置验证

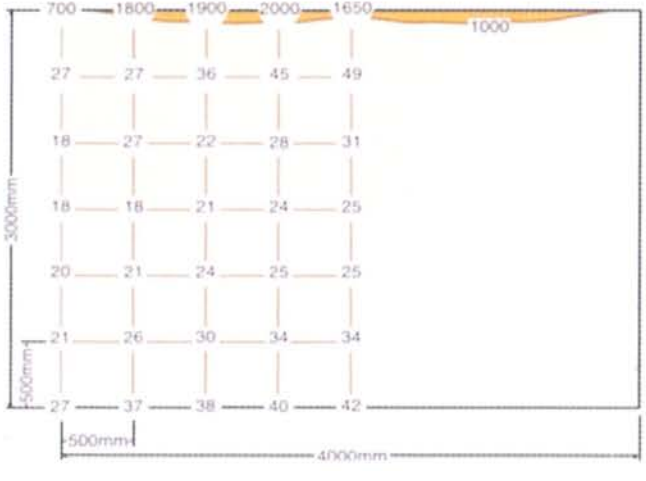
## 改变灯具的位置

光源与遮光板的距离保持不变；

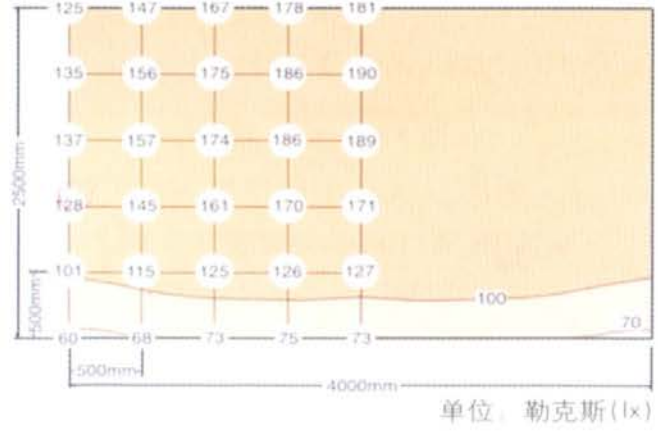
灯具距离灯槽中心为-100mm。








地面照度分布



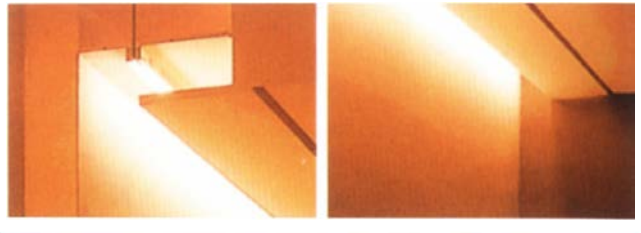

墙面照度分布

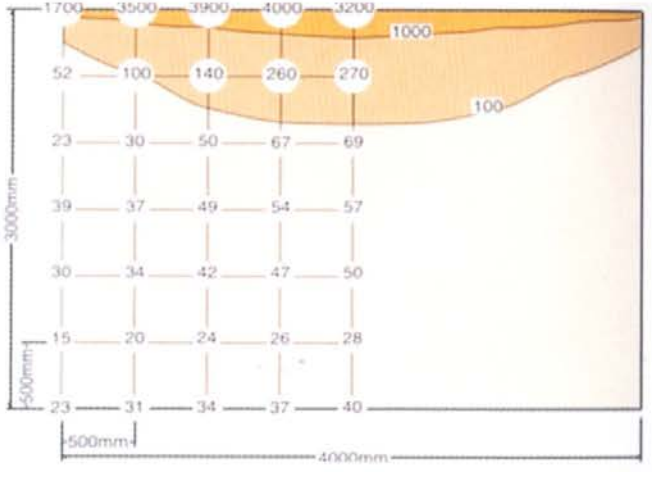
# - 光源的遮光位置验证

## 改变灯具的位置

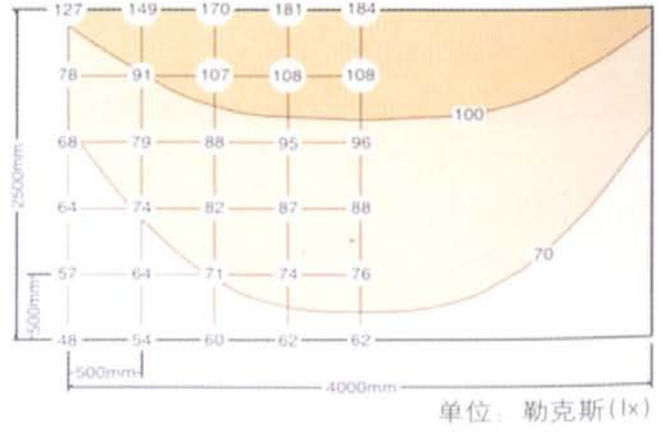
光源与遮光板的距离保持不变；

灯具距离灯槽中心为0mm。






地面照度分布



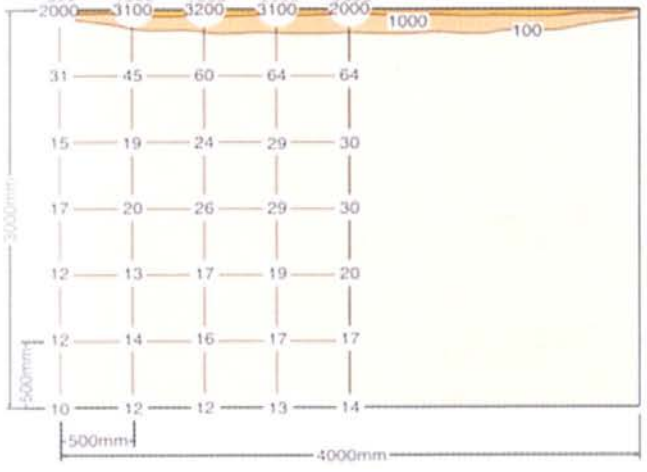

墙面照度分布

# - 光源的遮光位置验证

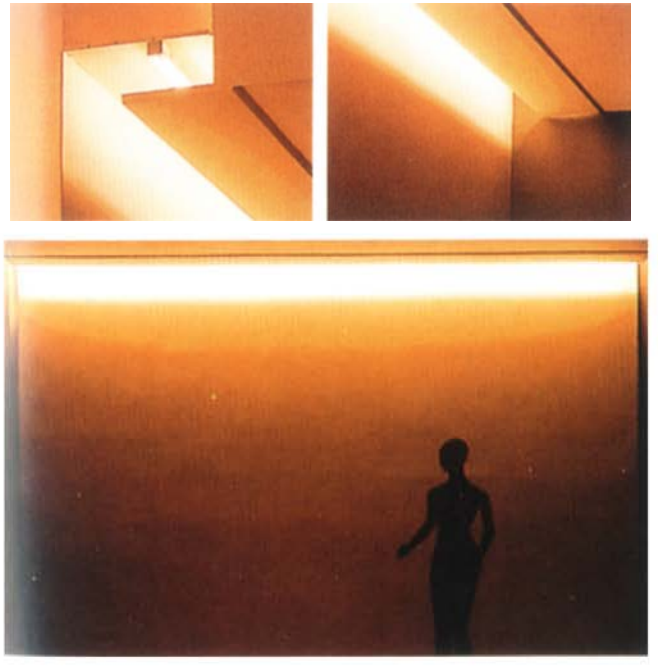
## 改变灯具的位置

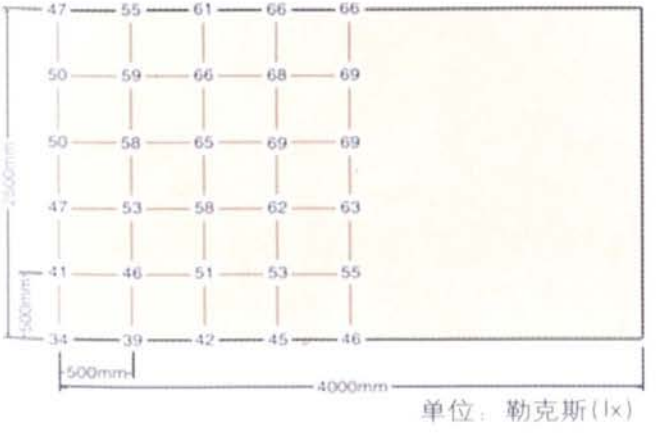
光源与遮光板的距离保持不变；

灯具距离灯槽中心为+100mm 。




地面照度分布






墙面照度分布

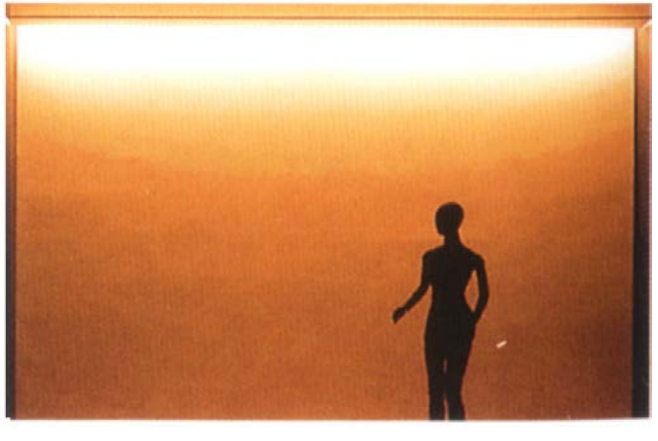
# - 光源的遮光位置验证

## 改变灯具的位置

光源在灯槽中心位置+100mm时，遮光线在墙面上明显地显现且照度分布也不均匀。而光源在灯槽中心位置-100mm时，不仅遮光线在地面上出现，光源映射在地面上被看到的可能性也会很大。

因此，可以看到将遮光线设置到墙面与地面相交的交角处才是最佳的。

灯具距离灯槽中心-100 mm



灯具距离灯槽中心 0 mm

灯具距离灯槽中心+100 mm

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# 展柜灯光

被照展品的大小及形态决定了展柜灯光的布置，解决垂直照度是展柜照明首选

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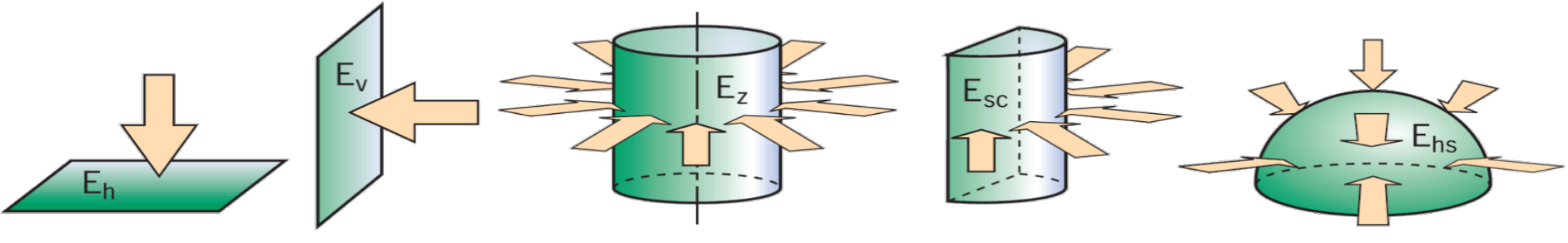
# 照度的类型




- 水平照度 垂直照度 柱面照度 半柱面照度 球面照度

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彩绘雁鱼灯

西汉（公元前 206-8 年）
1985 年陕西省神木县西汉墓出土
陕西历史博物馆藏

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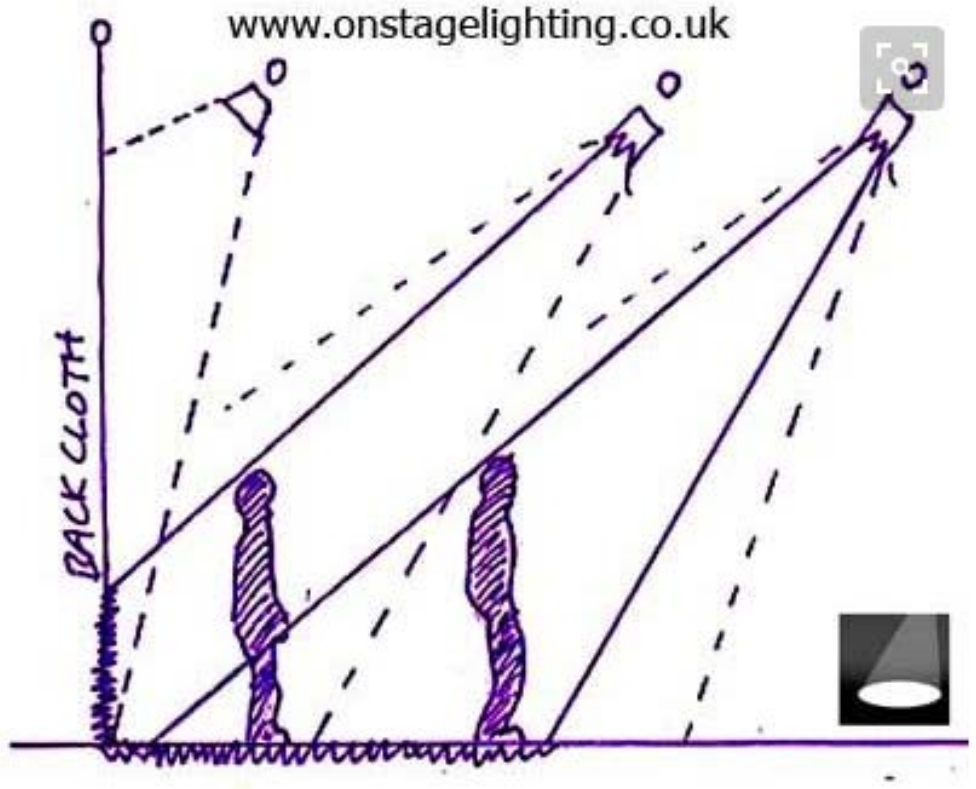

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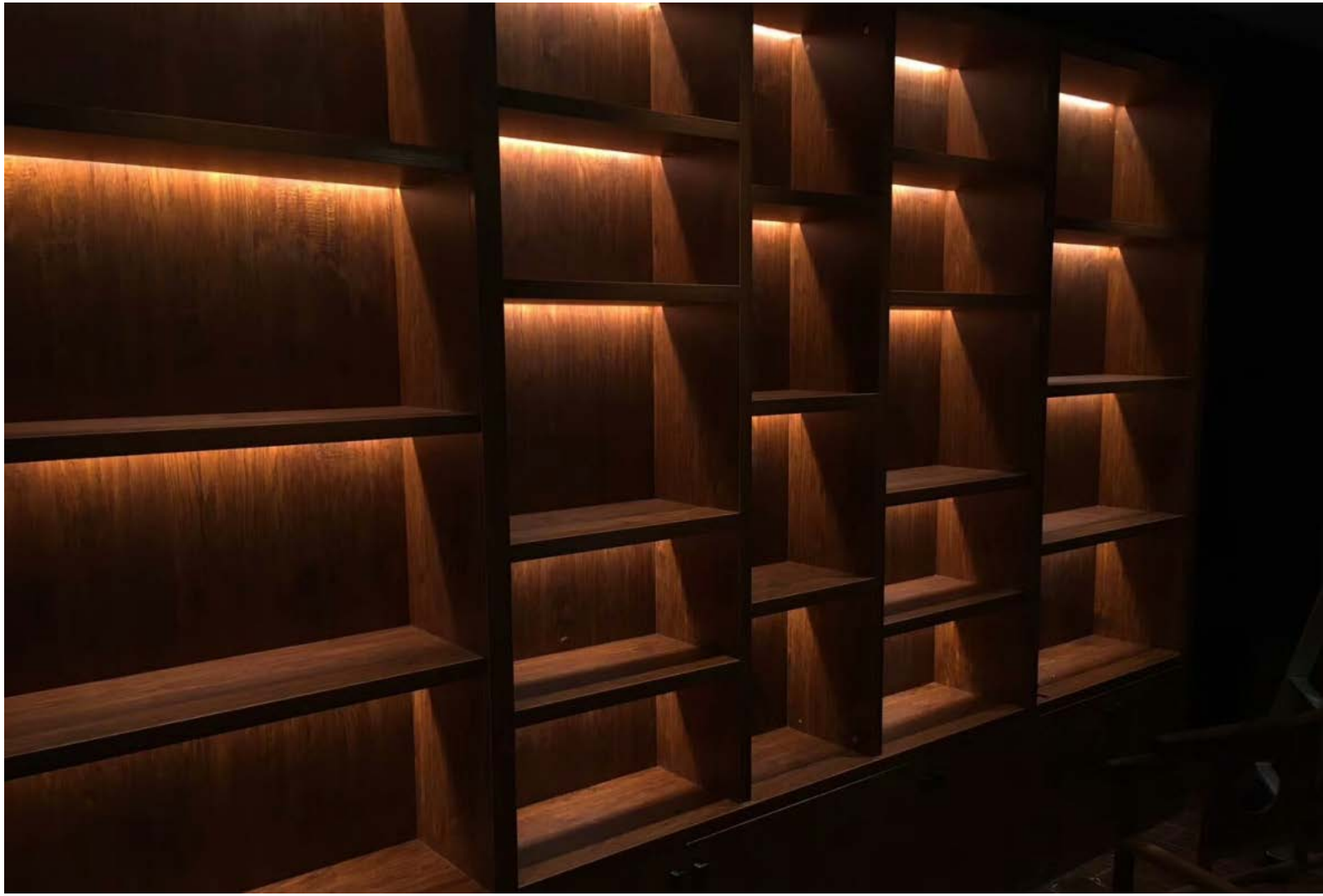

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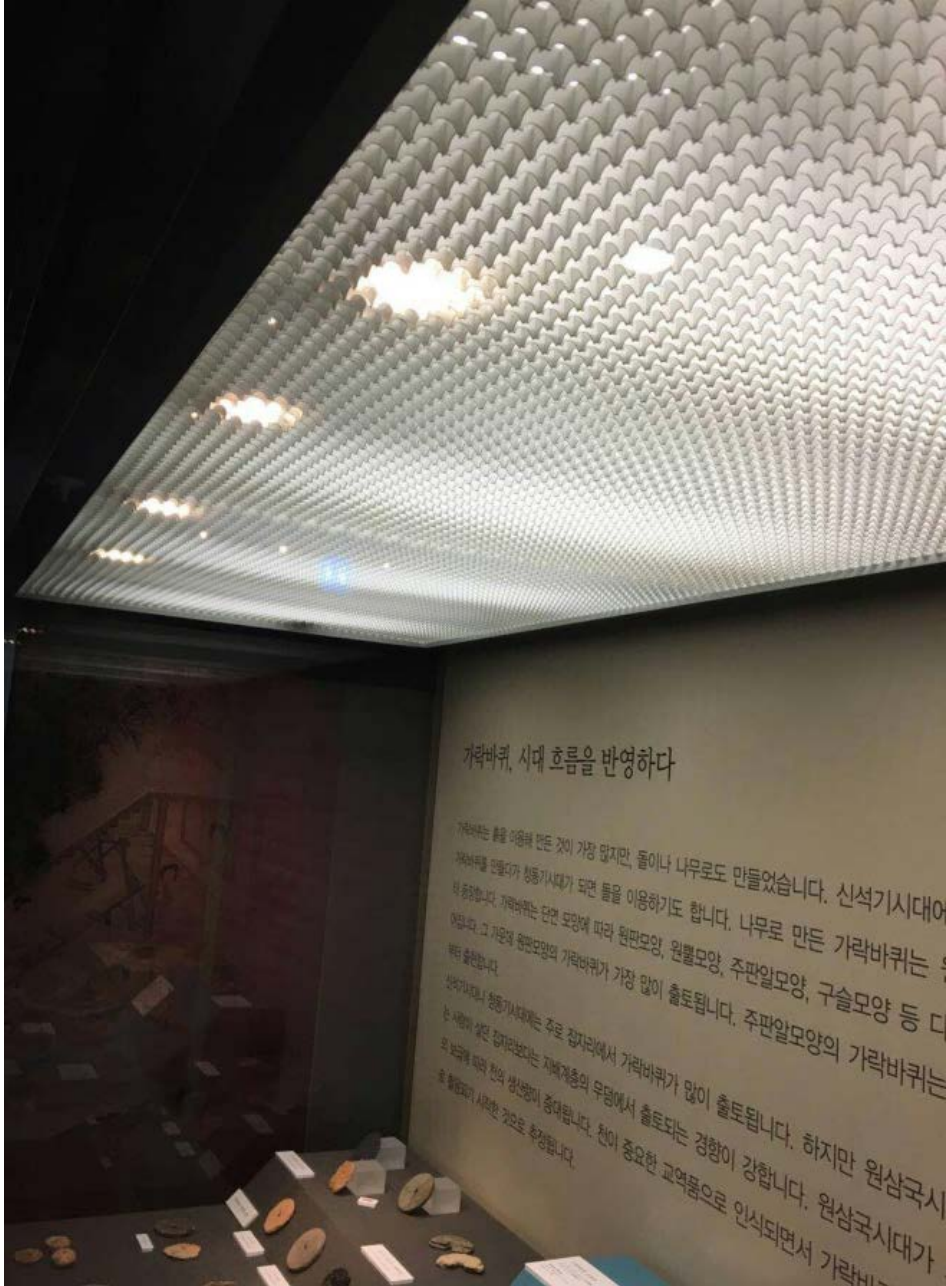
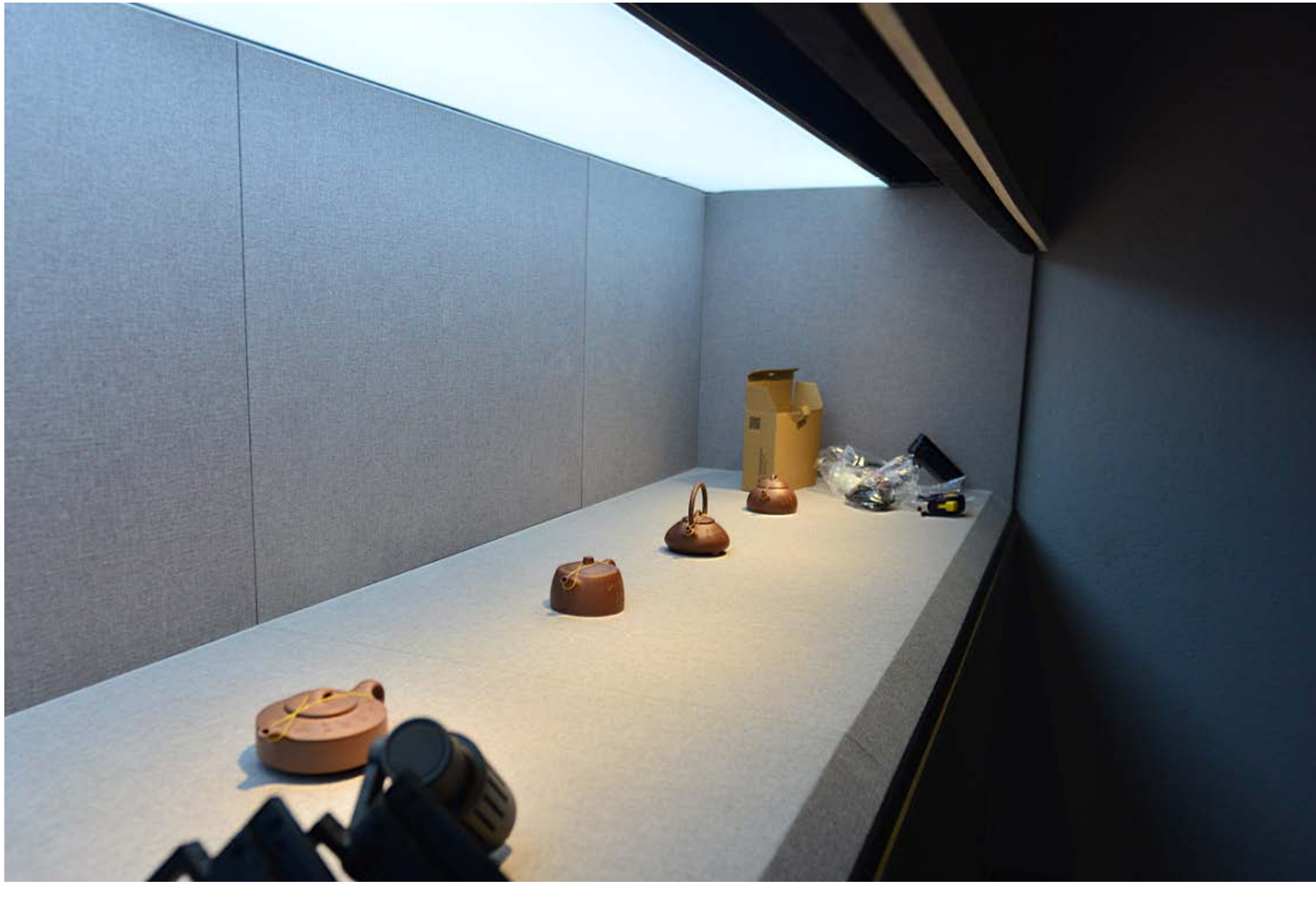
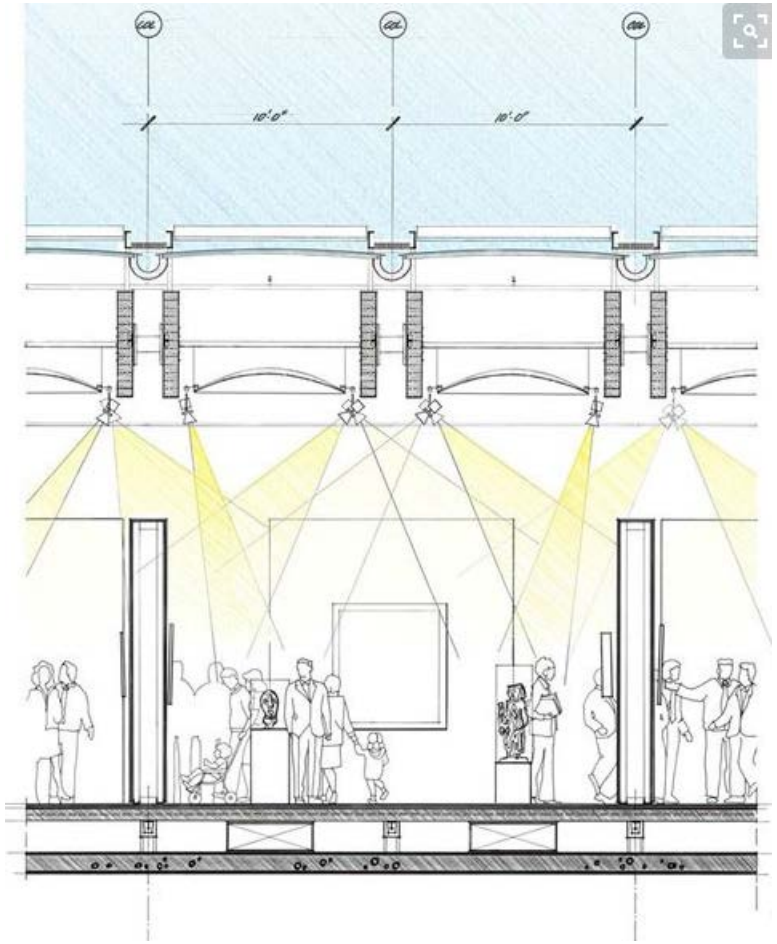




# 艺术品陈设照明


10'-0"
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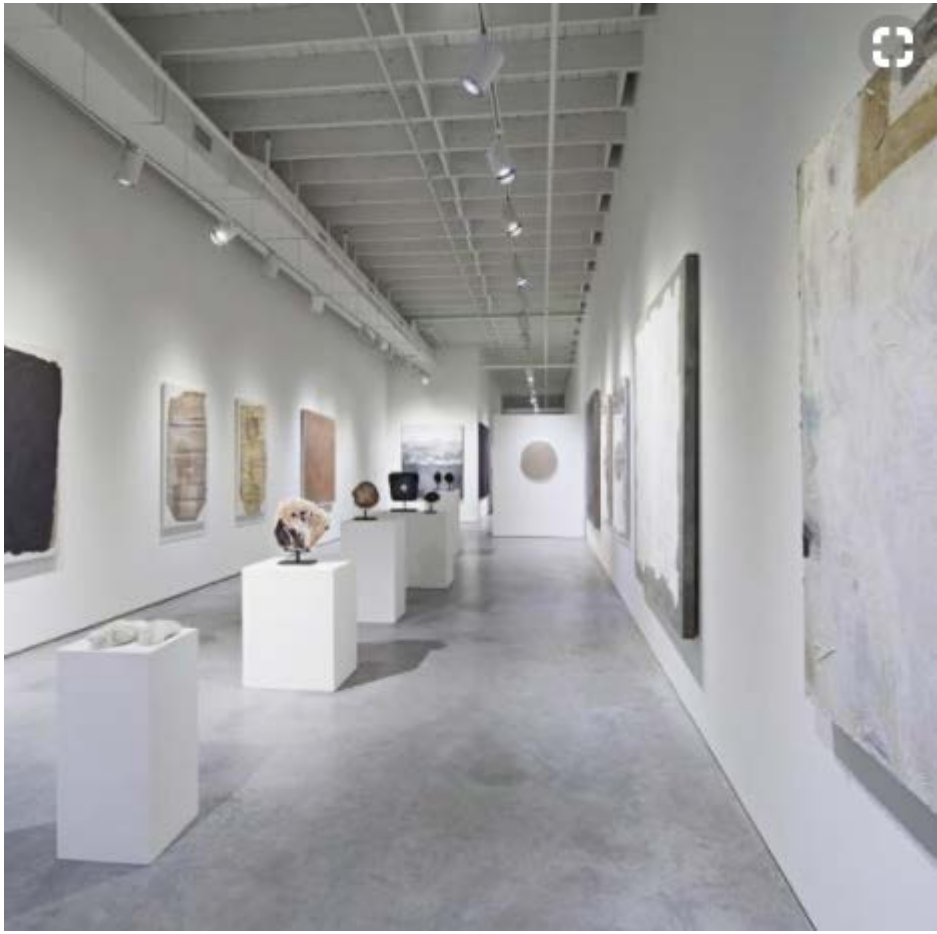

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客房导视图
Guest room pilot view

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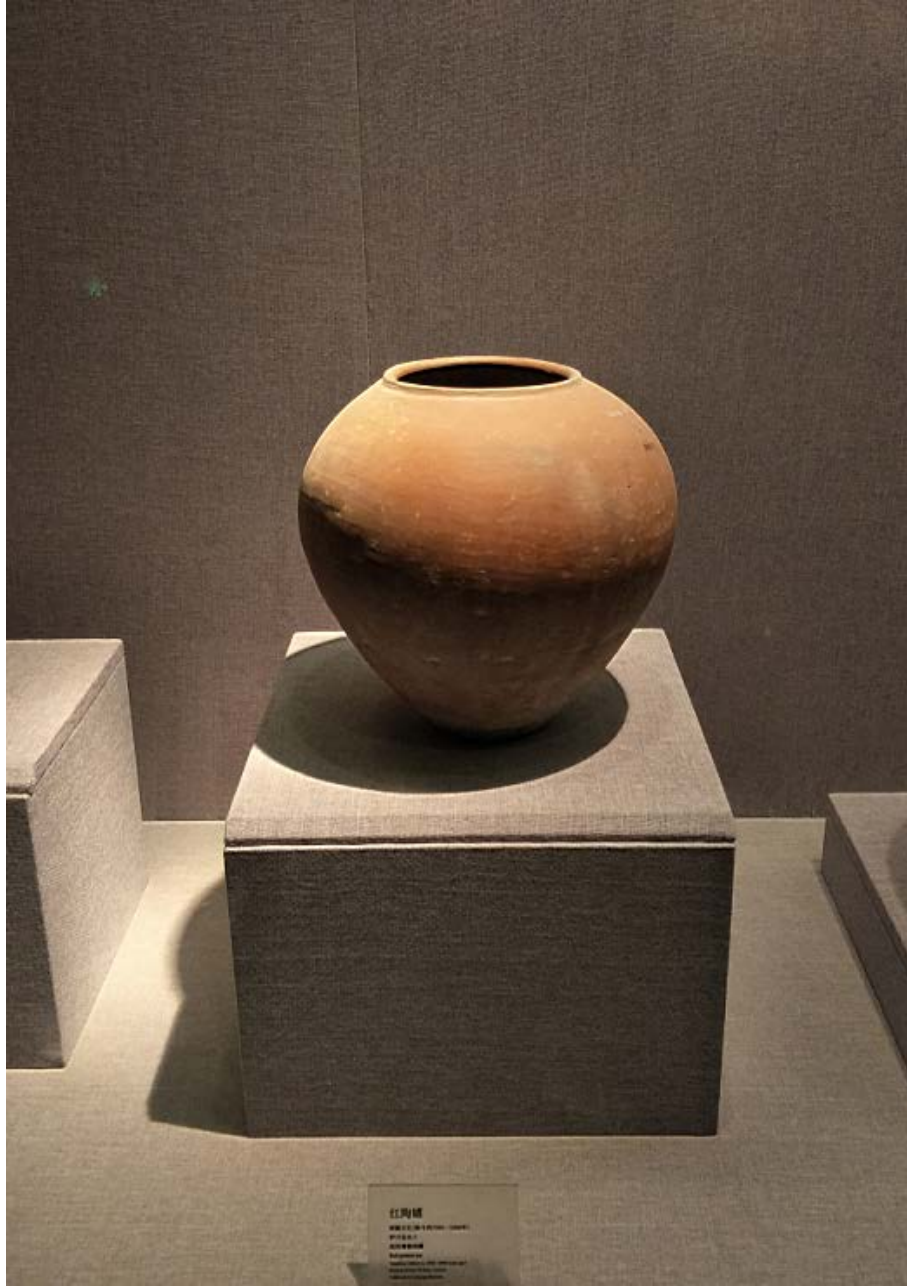

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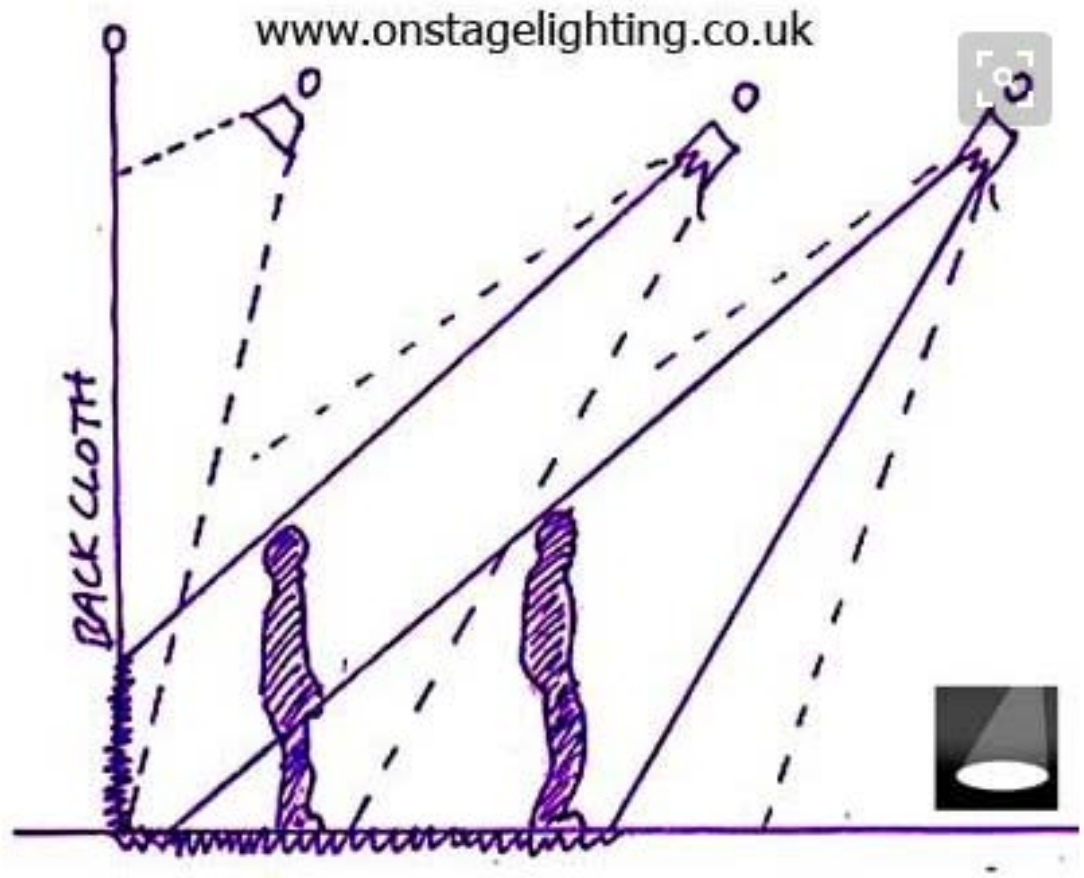

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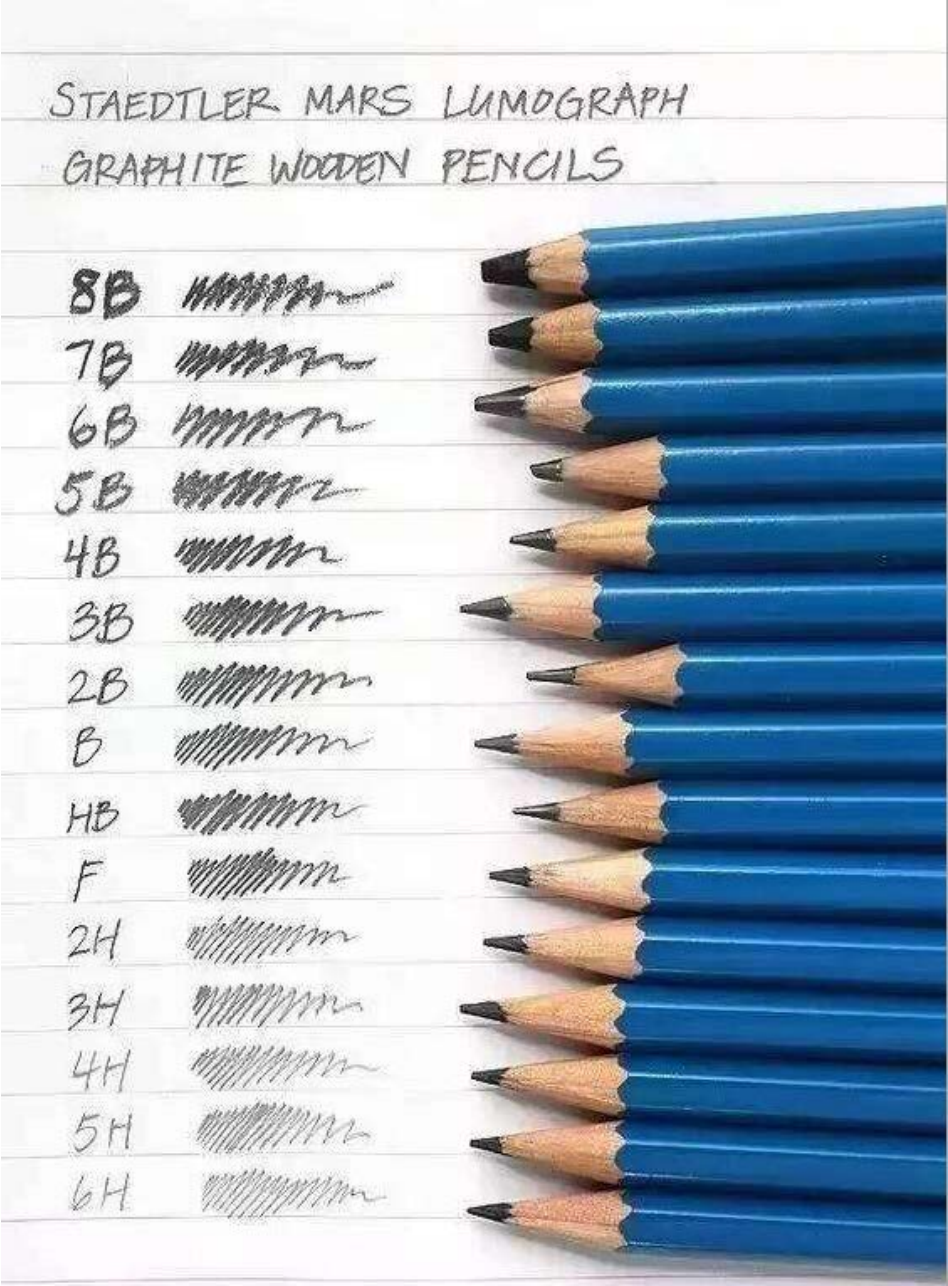
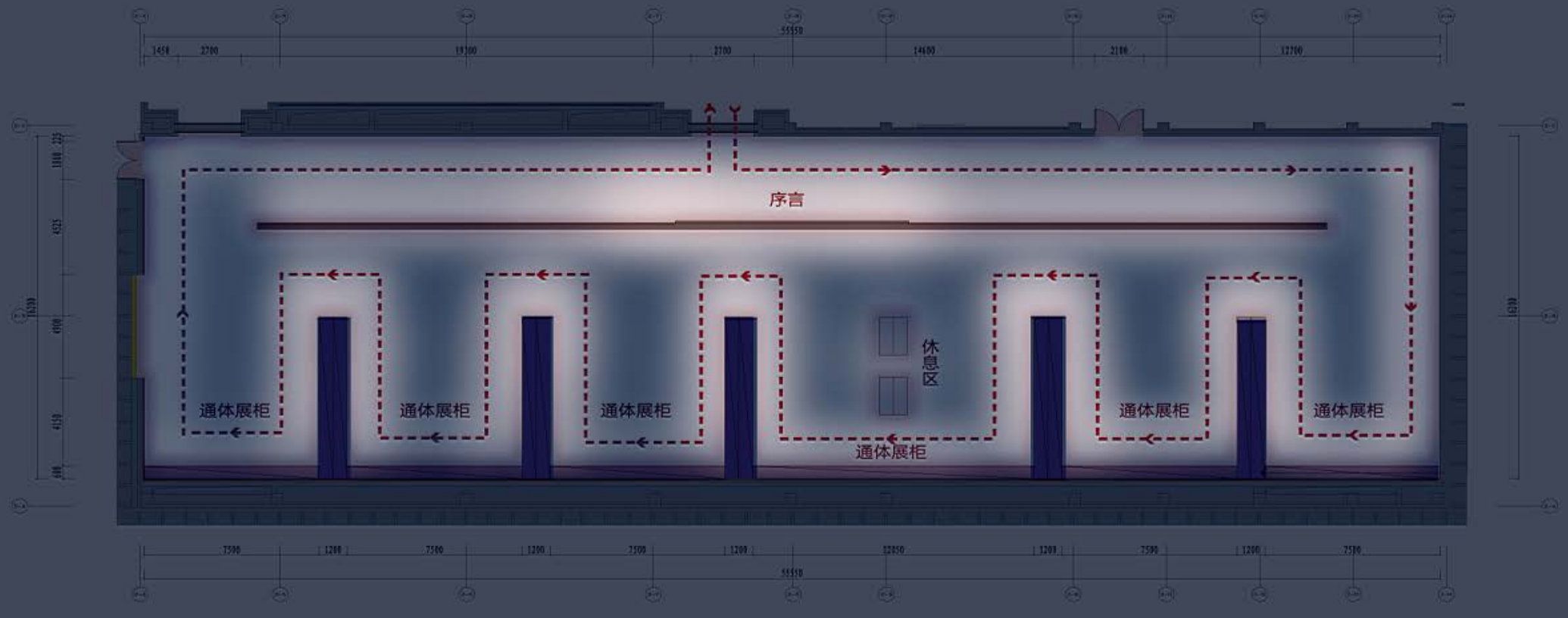
# 空间层次






二层油画厅平面布置图

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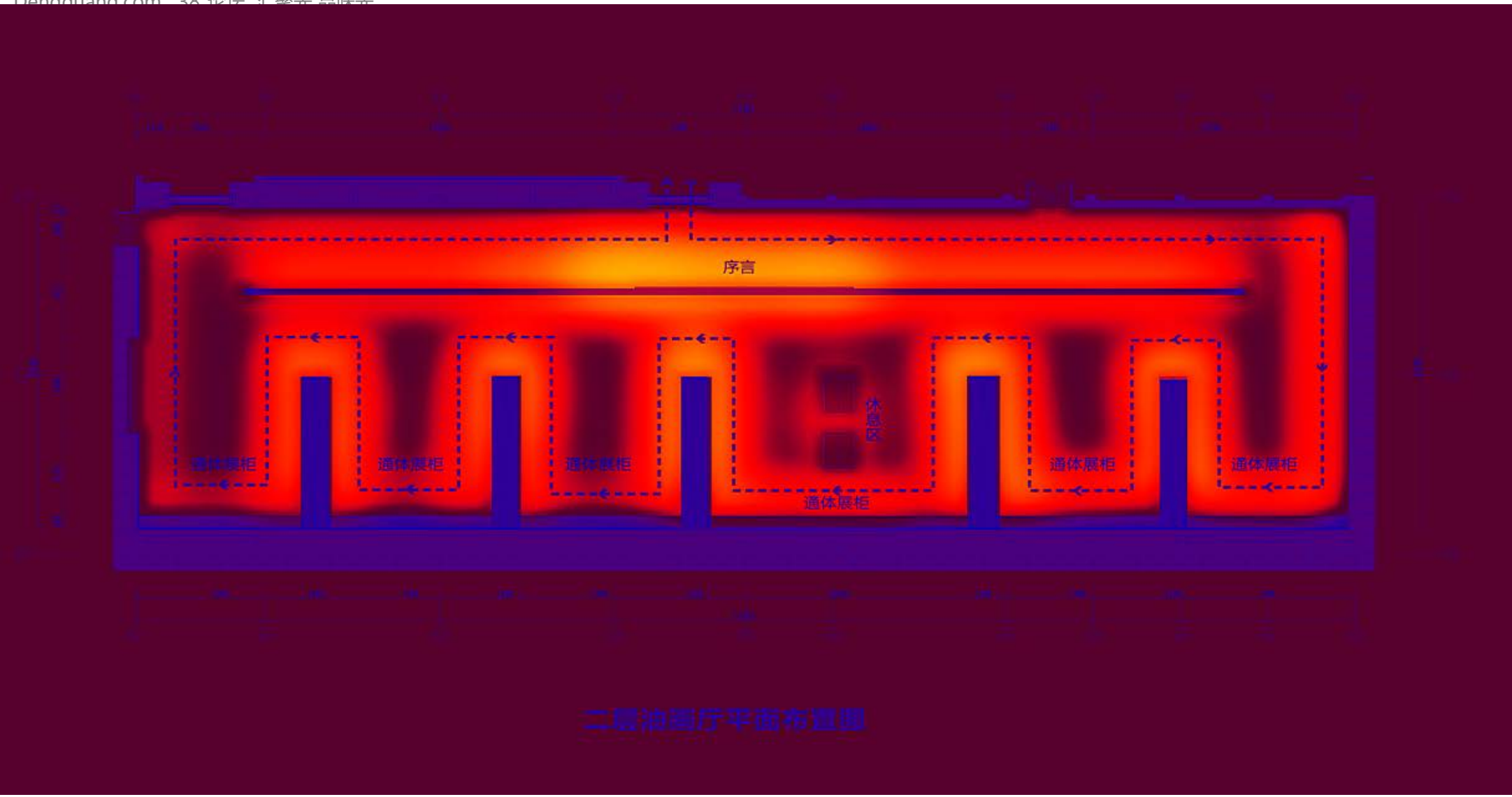

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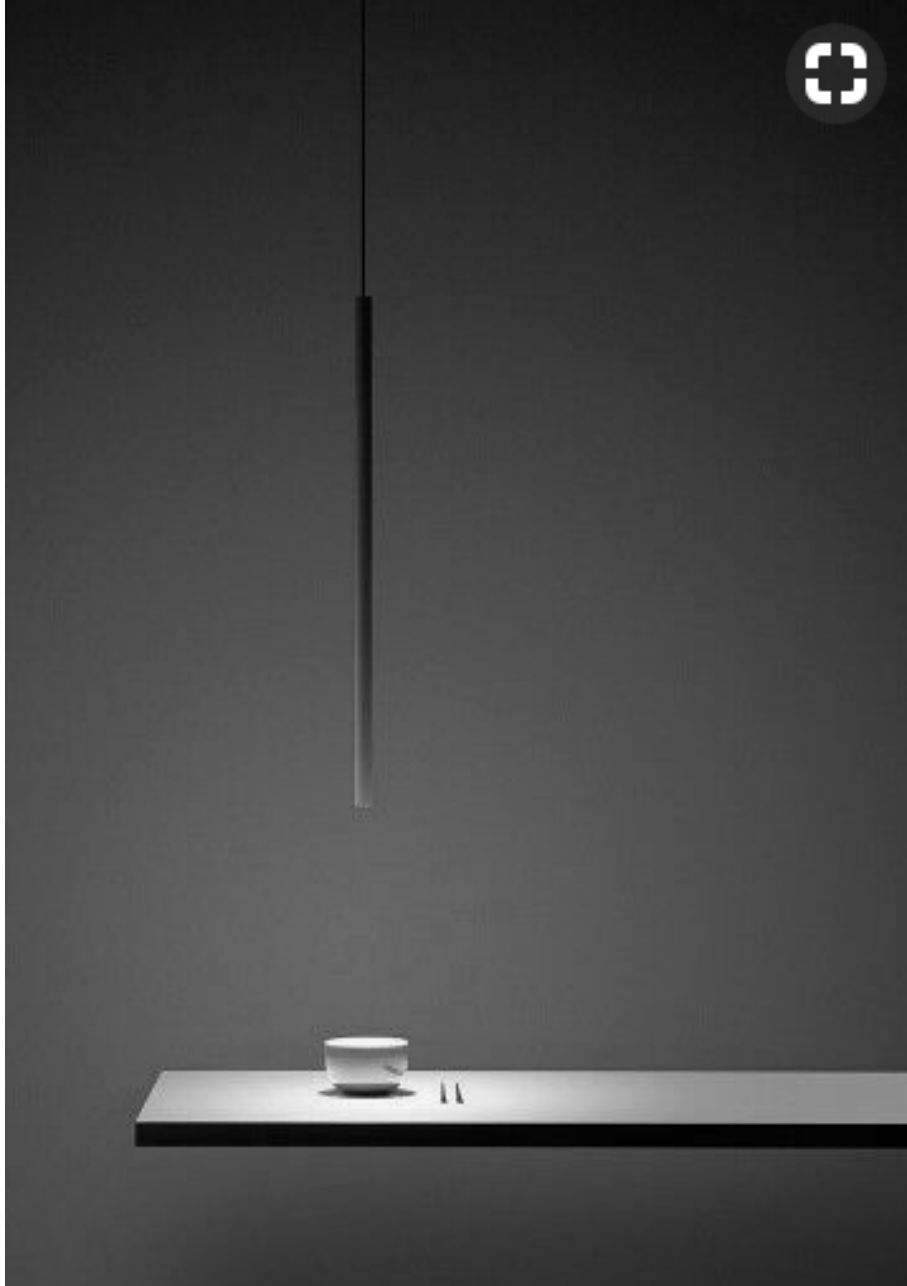

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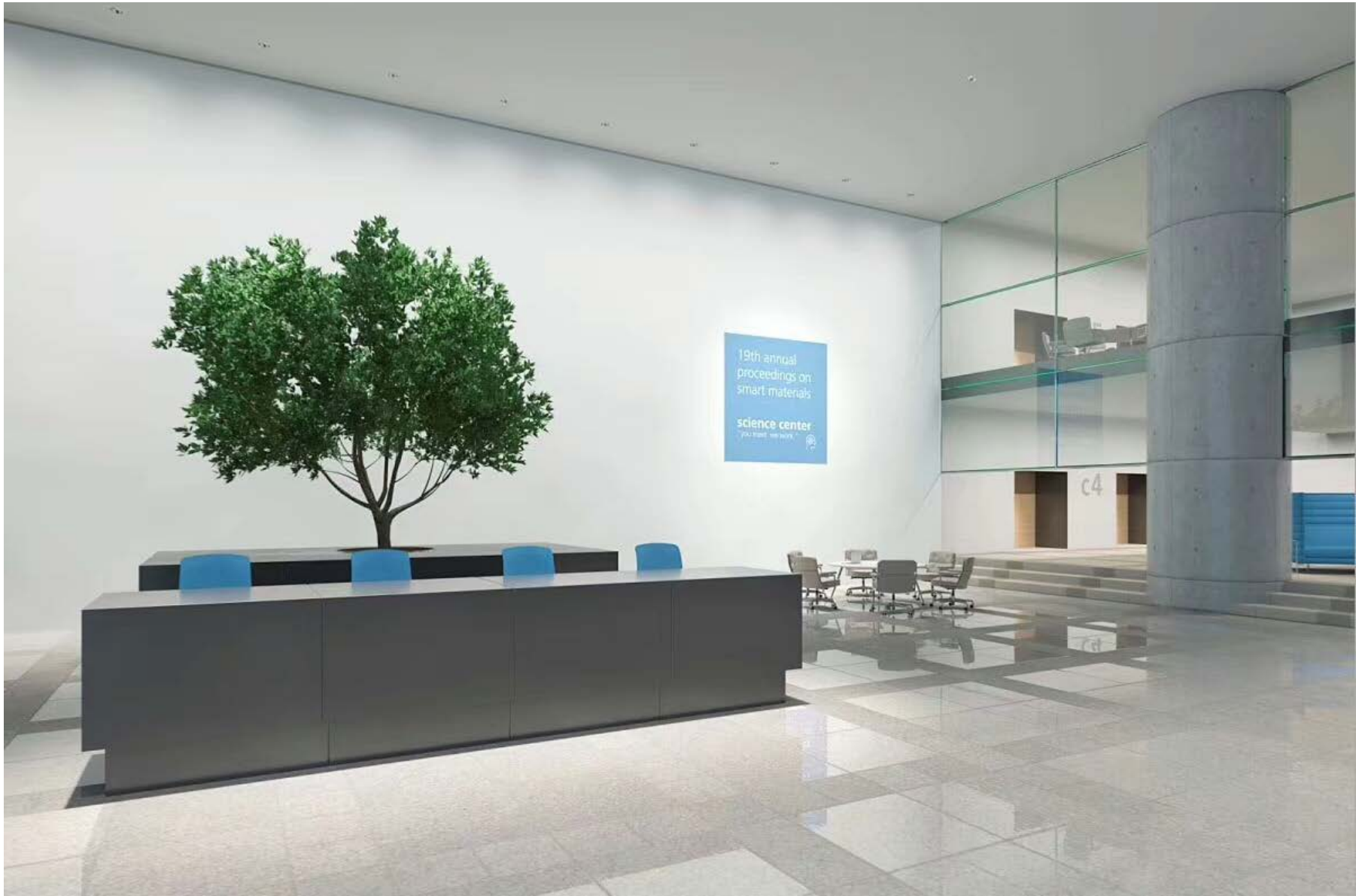
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强调视觉中心点

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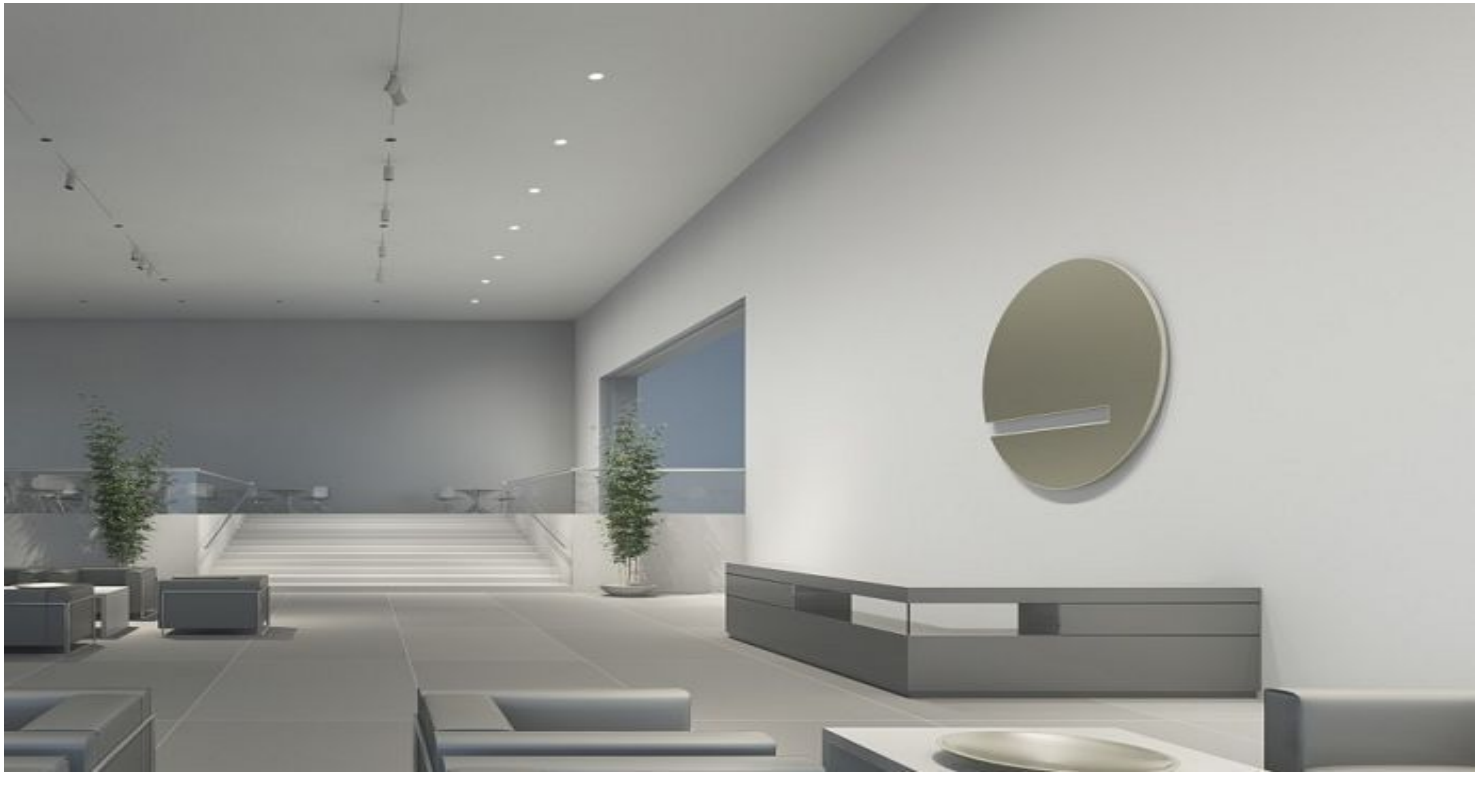
# 照明方式

## 基础照明

环境照明的基本内容是基础照明——确保展厅内必要的基本的亮度的照明。

伴随着展览需求的多样化，展览馆的印象，演绎的方法和对空间的考虑等，都变得很重视整体的氛围。整体的环境也成为了展览的一部分被考虑进去。

# 照明方式



# 照明方式

# 照明方式

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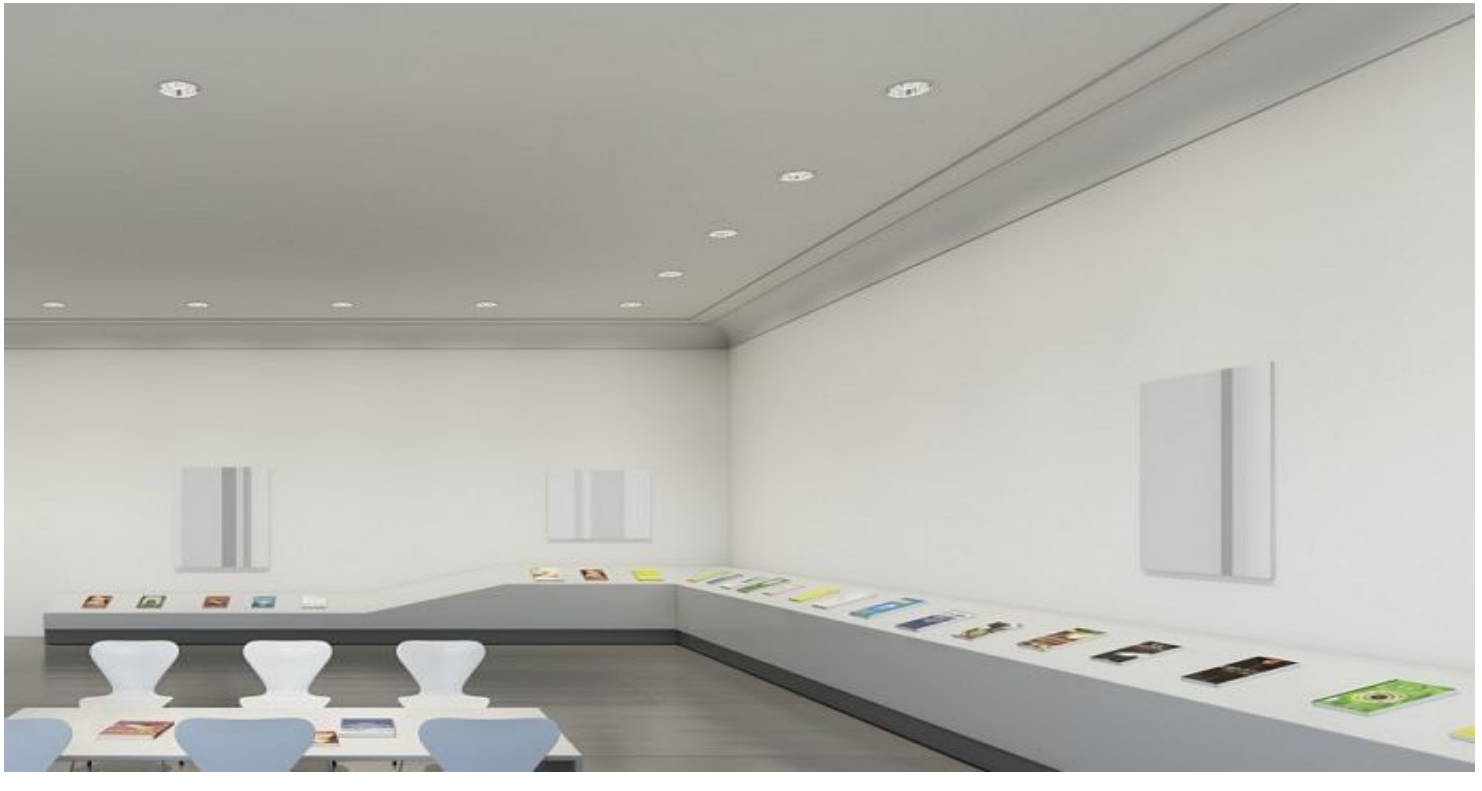
# 照明方式

从基础照明进一步设想，根据不同光的种类的选择和演绎，渲染展览概念的环境照明考虑方法变得非常重要

# 照明方式



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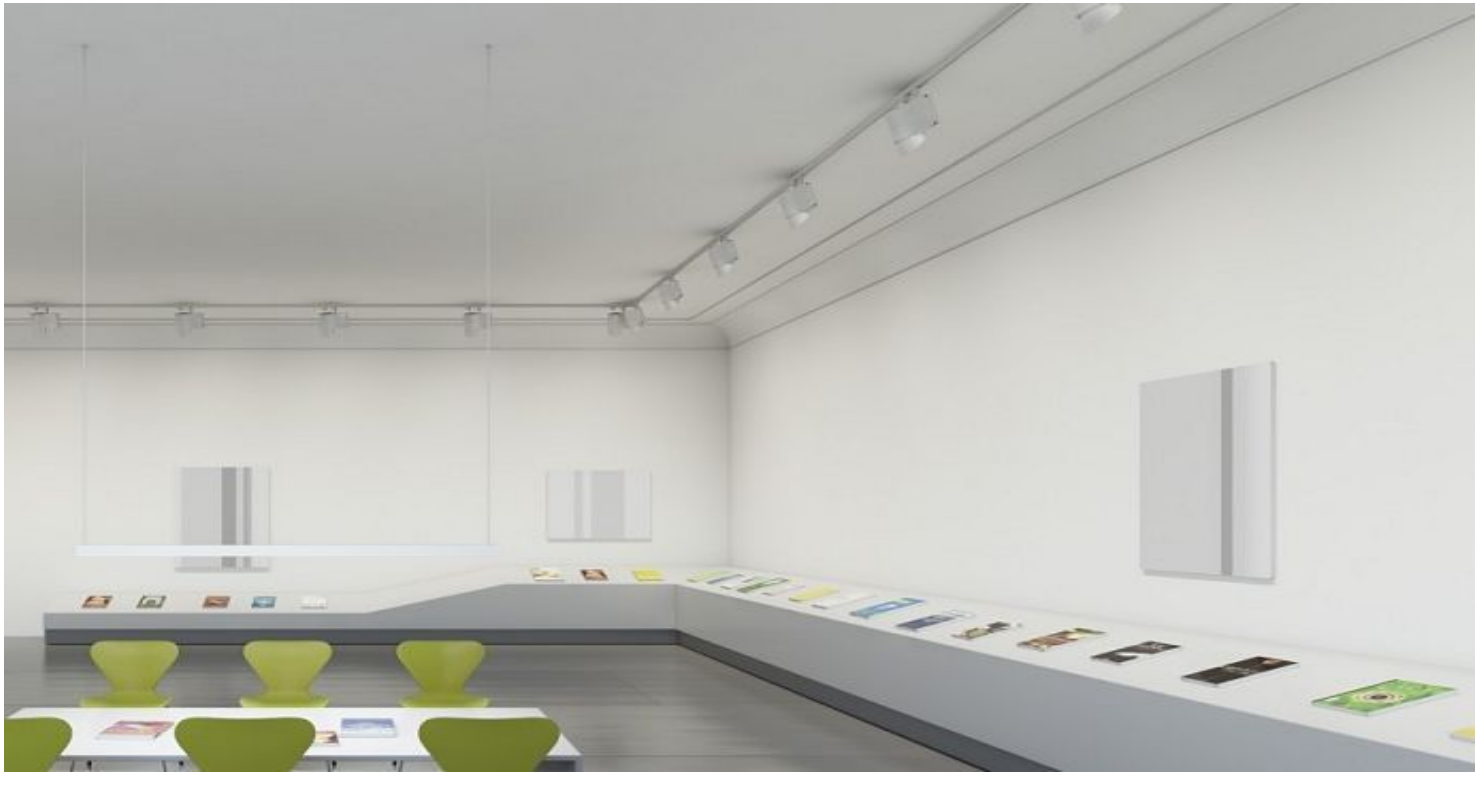

# 基本照明9

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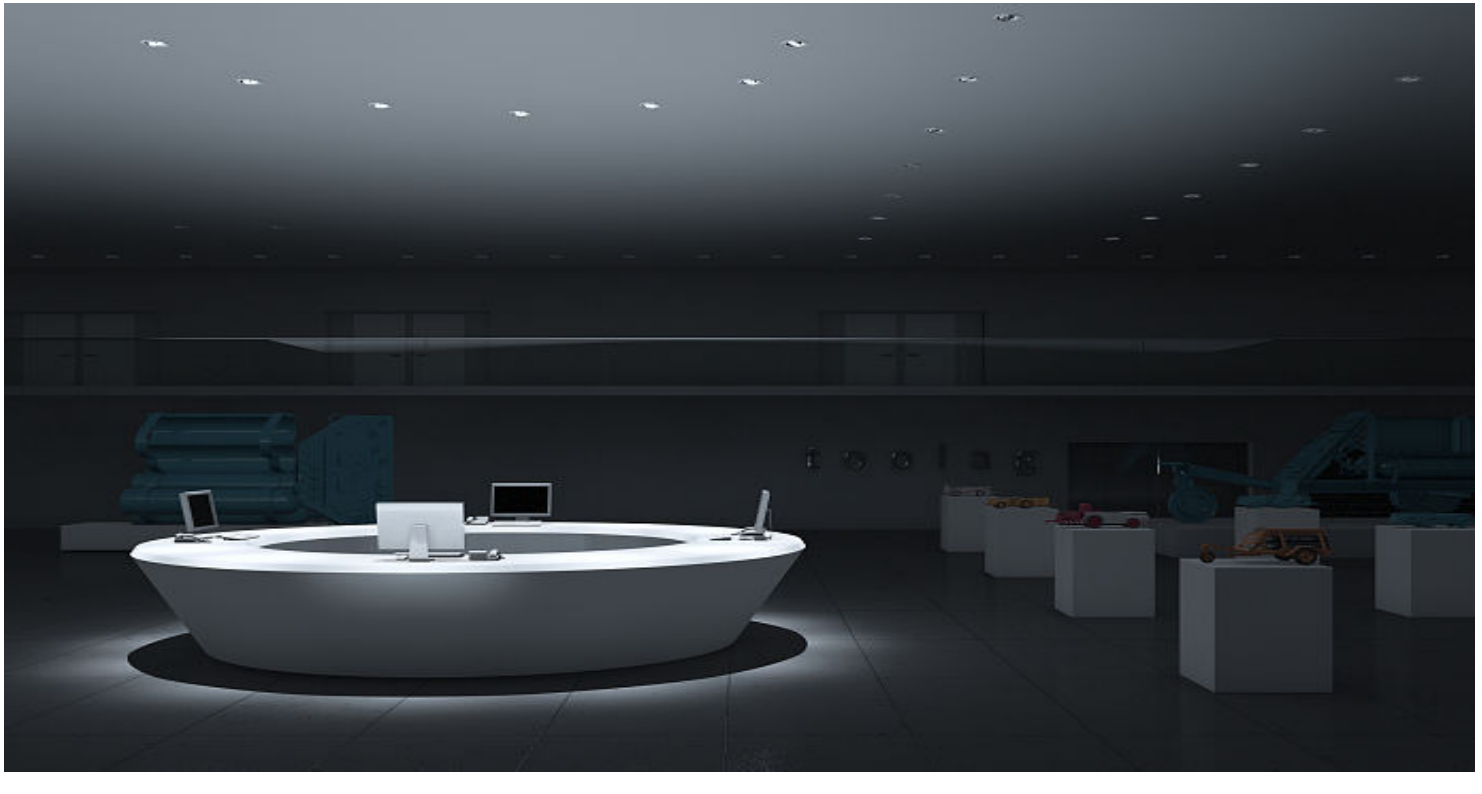
# 重点照明1



表现展品的特性，让商品显得更有魅力。给予具有光泽感的展品以“光辉感”，给予要强调色彩的商品以最接近自然的光，而对于外形非常美观的展品则要给予能强调其轮廓的光从而使商品的魅力能最大限度地发挥。

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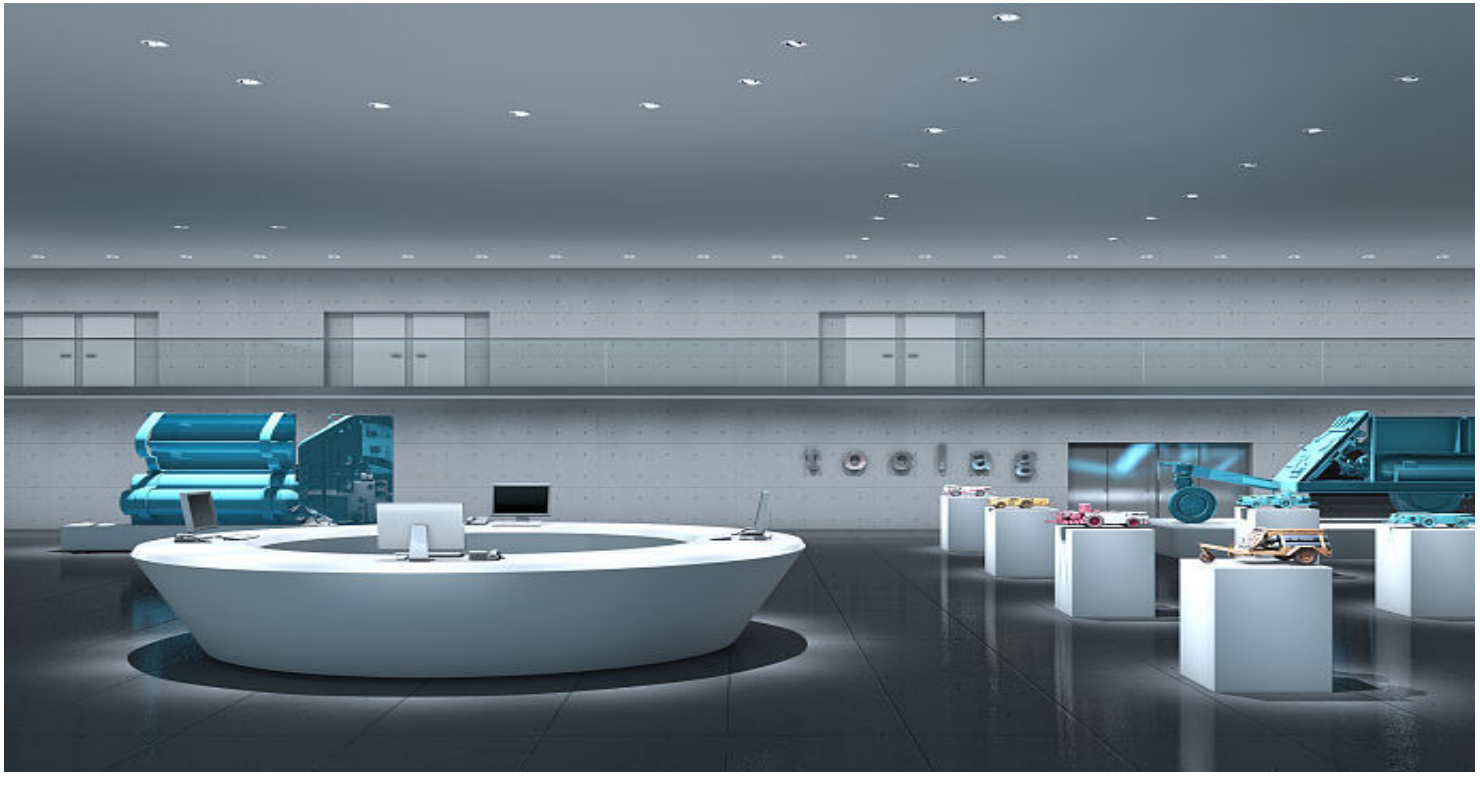
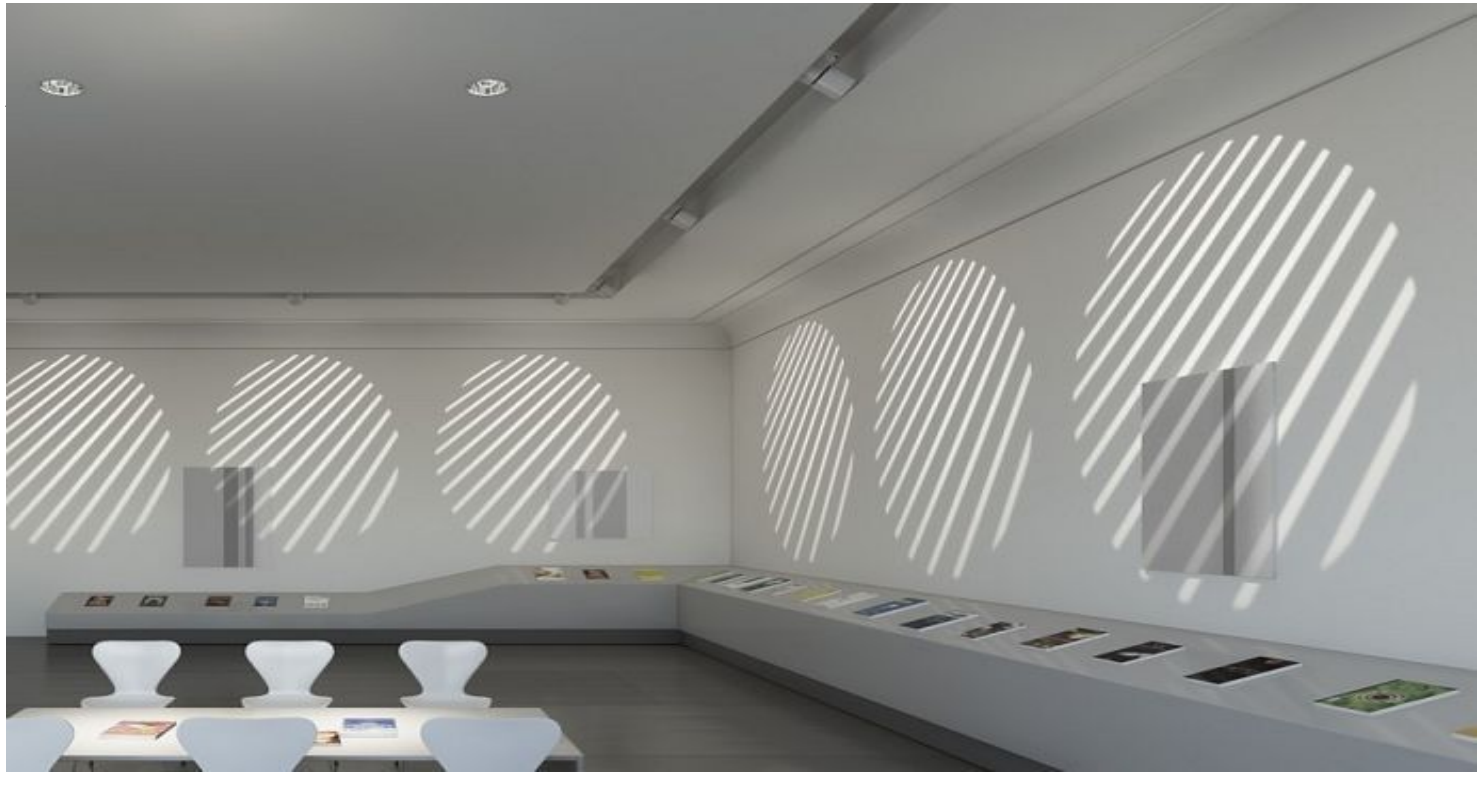
# 重点照明2

# 照明方式

## 重点照明3



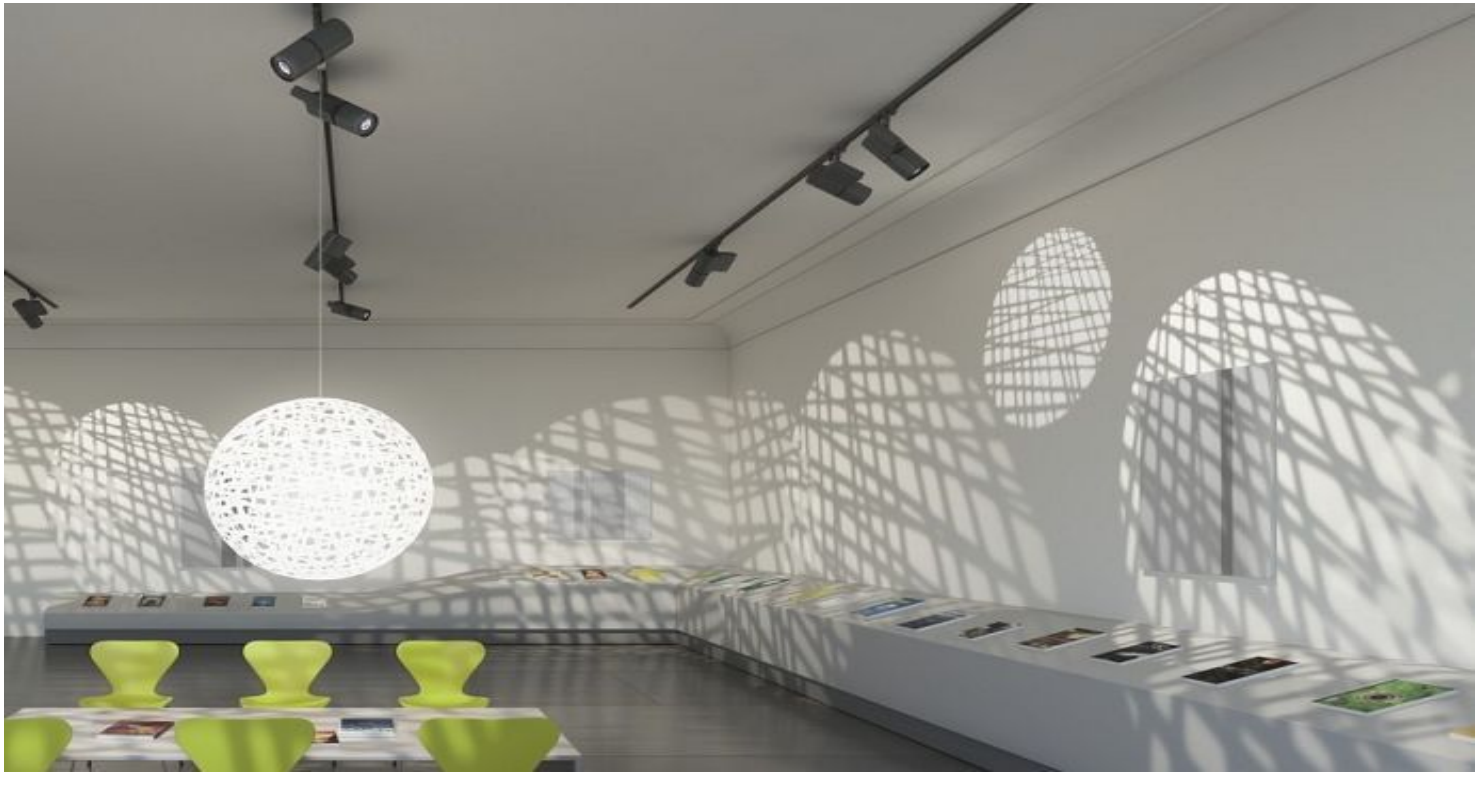
# 照明方式



装饰照明

装饰照明通常应用于场景再现

# 装饰照明2



# 灯具的选择

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# 选择的要素

- 照明功能（设计概念）、垂直照度、和谐分布、灯具外观与建筑空间美学、眩光、频闪、物体造型、阴影、高光点、视觉几何关系、控制与调光

# 选择的要素：照明功能（设计概念）

- 根据作业所需的照明功能，选择：
- 合适的功率档和总功率——灯具大小和LPD（功率密度）；（亮空间,暗空间）

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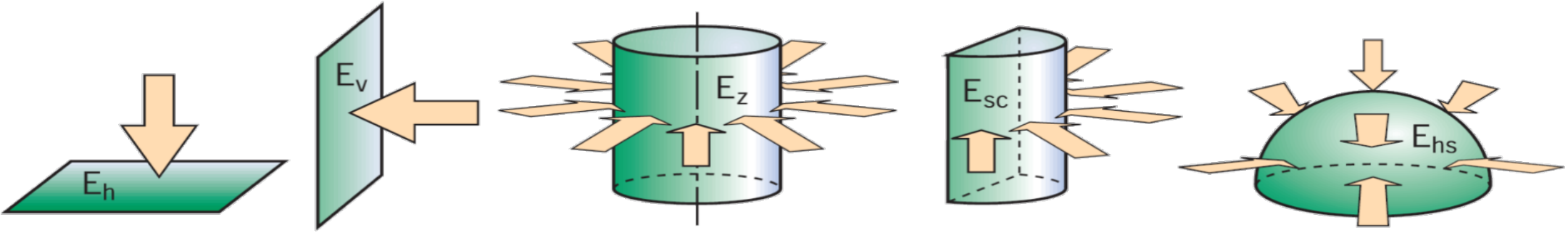
# 选择的要素：垂直照度

- 单灯还是多灯？怎么样的配光兼顾垂直照度（根据设计空间所决定)




水平照度　垂直照度　柱面照度　半柱面照度　球面照度

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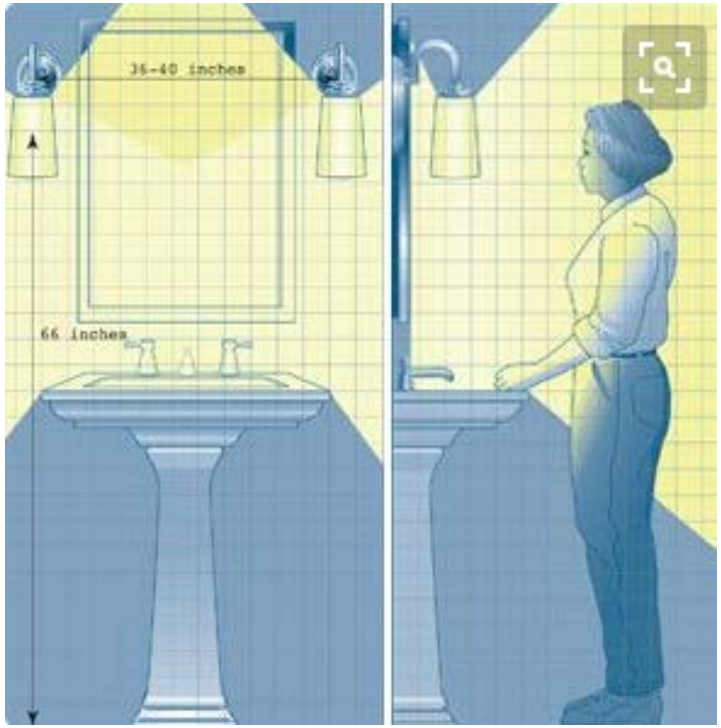
36-40 inches
66 inches

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# 选择的要素:和谐分布

- 合理的均匀度（照度或者亮度）
- 合理的梯度（快速过渡还是缓慢过度）
- 无论是很均匀还是很不均匀，都是基于对场景的分析定位。在满足基本功能的前提下，设计师的创意是自由的。
- 重点照明灯具和一般照明灯具的结合，可以营造丰富的层次，从对象到背景

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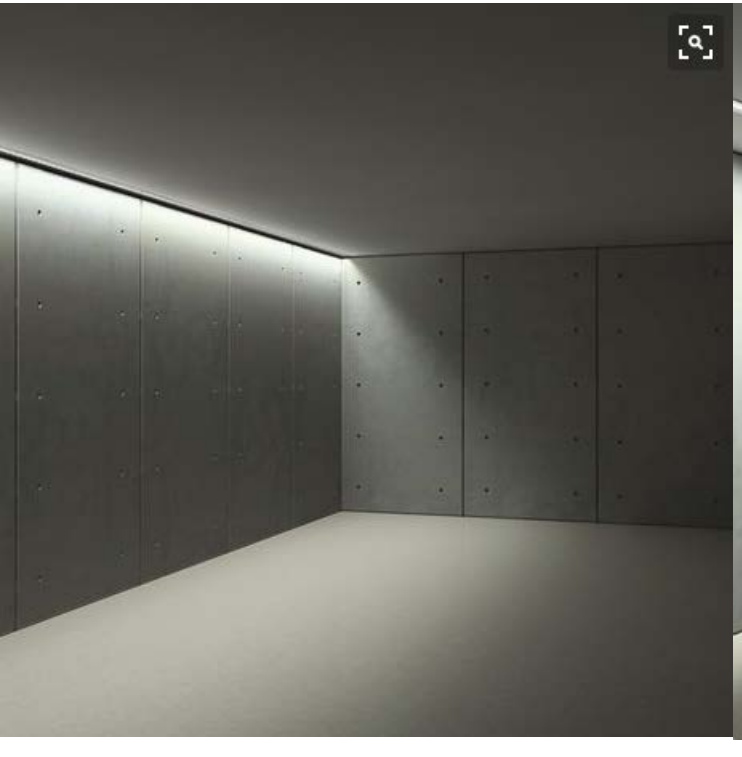

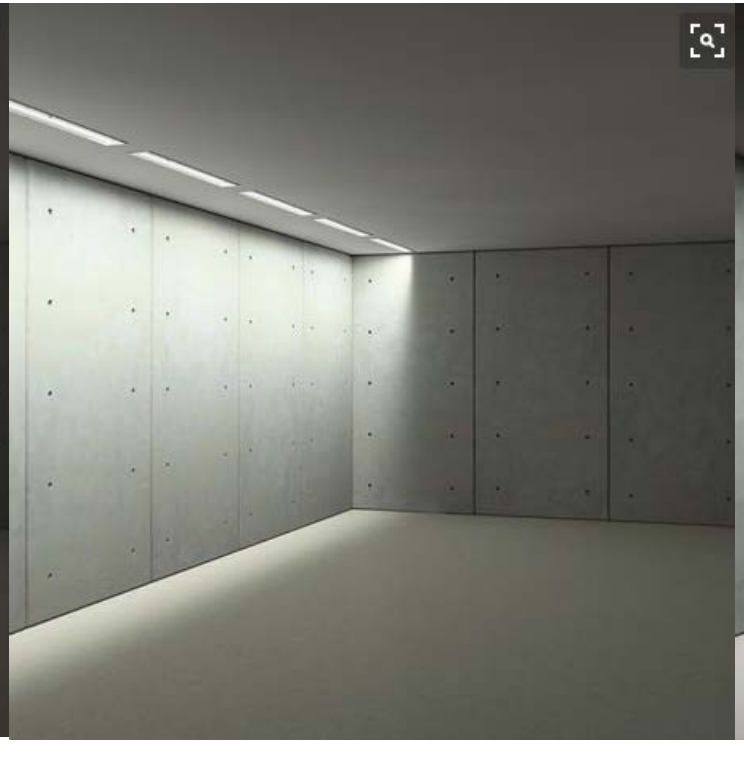

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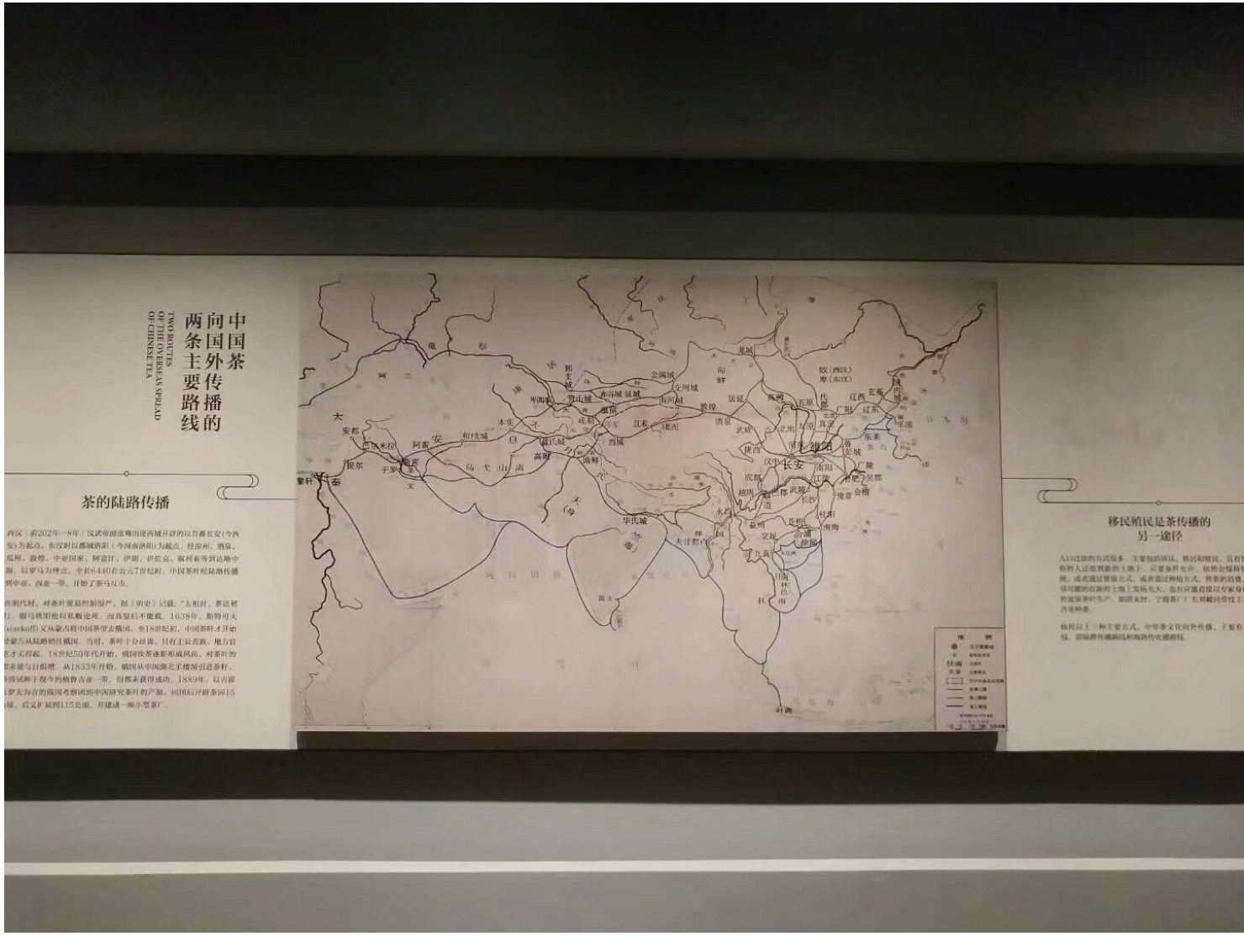

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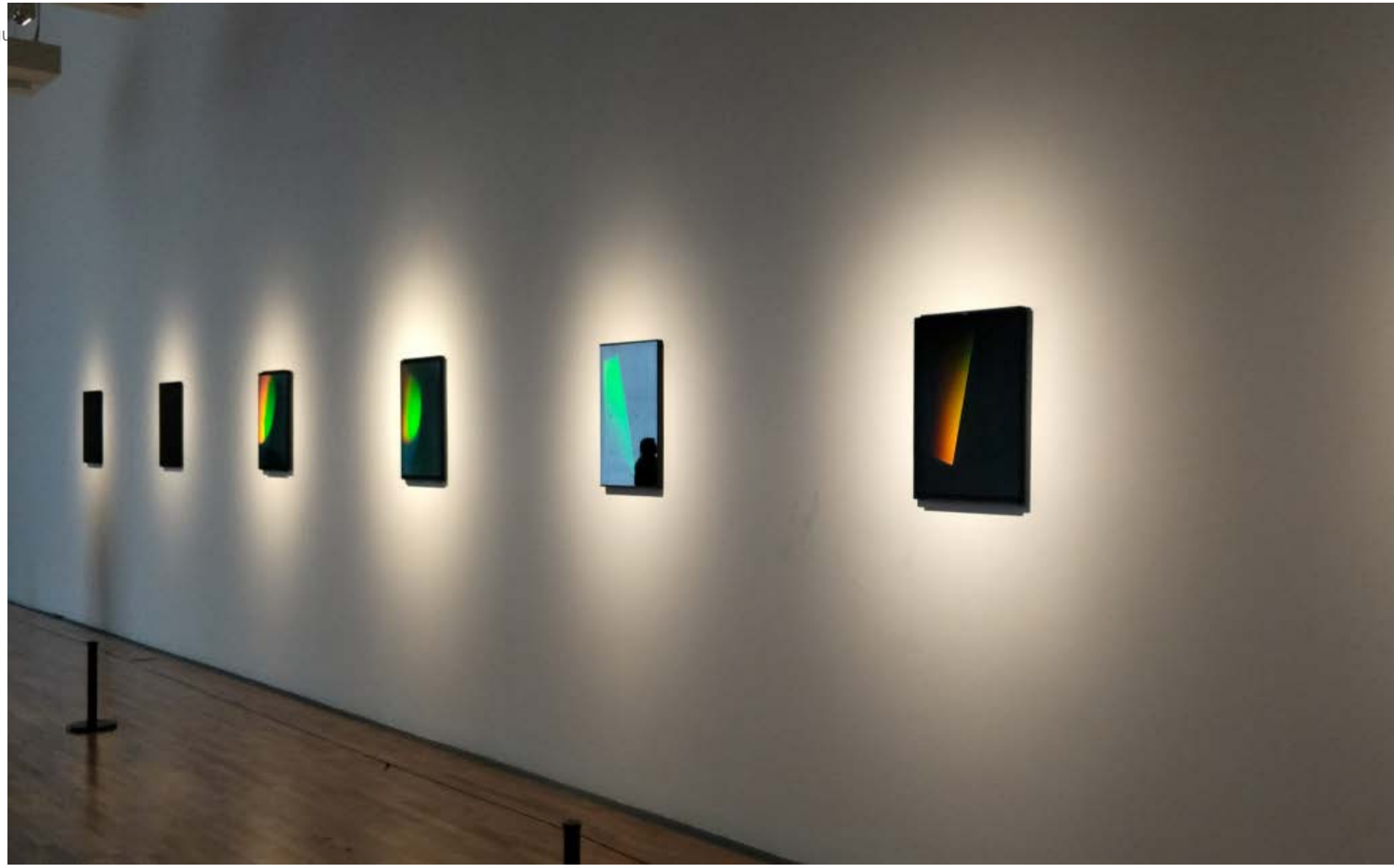

# 选择的要素：外观与空间

- 尽量隐藏，淡化灯具自身。
- 如果不能隐藏，灯具就是空间的一分子。
- 灯具可以张扬自己，也可以以建筑空间的风格为自己的风格。
- 除了形式美感，还要考虑文化融合。

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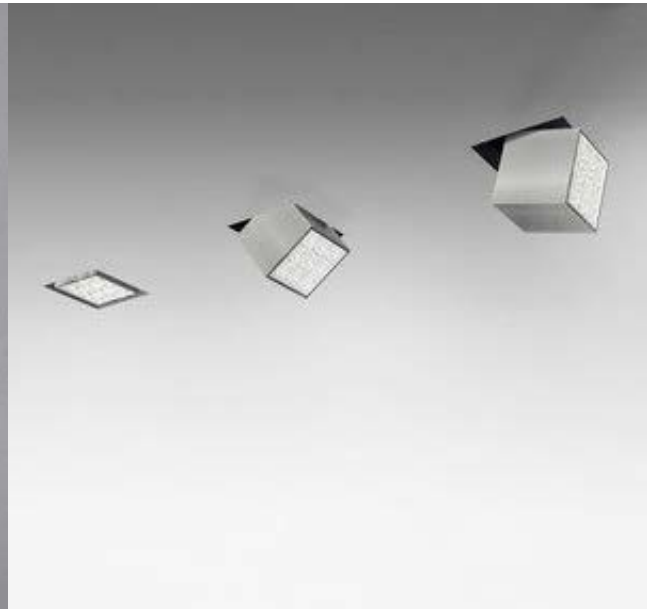

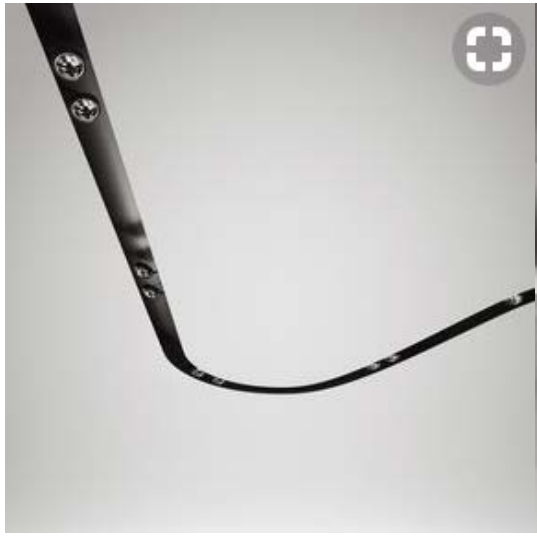

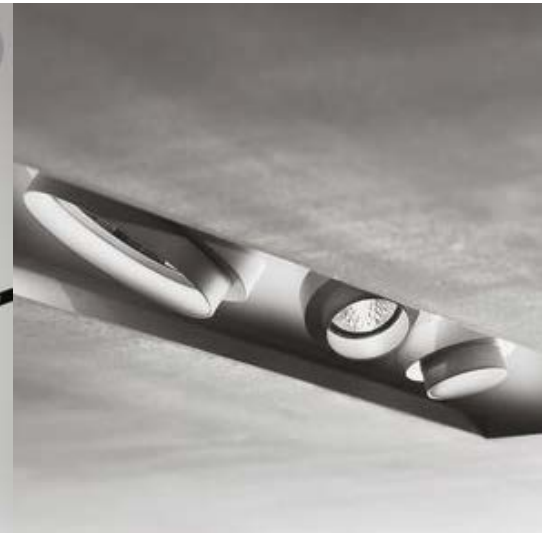

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**Kriptos** è un sistema estremamente versatile per la creazione di una nicchia luminosa: a soffitto, o a parete

**Kriptos** is an extremely versatile system for creating a niche light on the ceiling or wall

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Profili in alluminio installati per creare una nicchia di lato 100 mm **(Kriptos 100)**, dove è possibile installare in entrambe i lati lampade fluorescenti T5-FQ e faretti della serie Kriptos100

Aluminium profiles installed to create a niche in the side 100 mm **(Kriptos 100)**, where you can install on both sides T5 –FQ fluorescent lamps and spotlights series Kriptos100

Escursione minima e massima dei faretti serie **Kriptos 100**

Minimum and maximum excursion of spots **Kriptos 100**

Profili in alluminio installati per creare una nicchia di lato 200 mm **(Kriptos 200)**, dove è possibile installare in entrambe i lati lampade fluorescenti T5-FQ e faretti della serie Kriptos 200

Aluminium profiles installed to create a niche in the side 200 mm **(Kriptos 200)**, where you can install on both sides T5 –FQ fluorescent lamps and spotlights series Kriptos 200

Escursione minima e massima dei faretti serie **Kriptos 200**

Minimum and maximum excursion of spots **Kriptos 200**

# 选择的要素：眩光

- 什么样的灯具类型（CIE分类）？
- 截光？遮光？往往无法避免反射眩光
- 表面低亮度？无法避免灯具出现在视野中，尽量降低灯具出光面的亮度
- 反射？反射照明避免了绝大部分眩光，但容易造成平淡的场景效果

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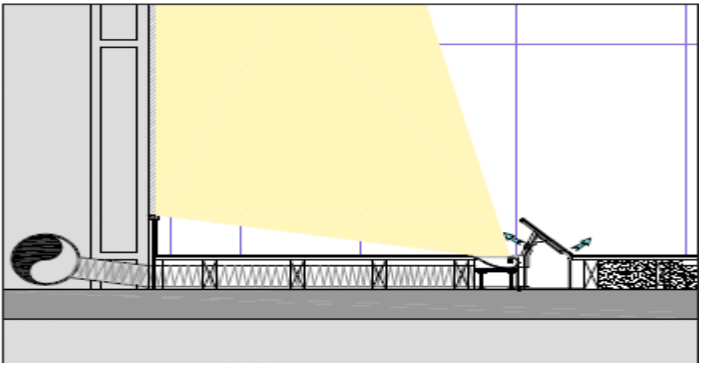

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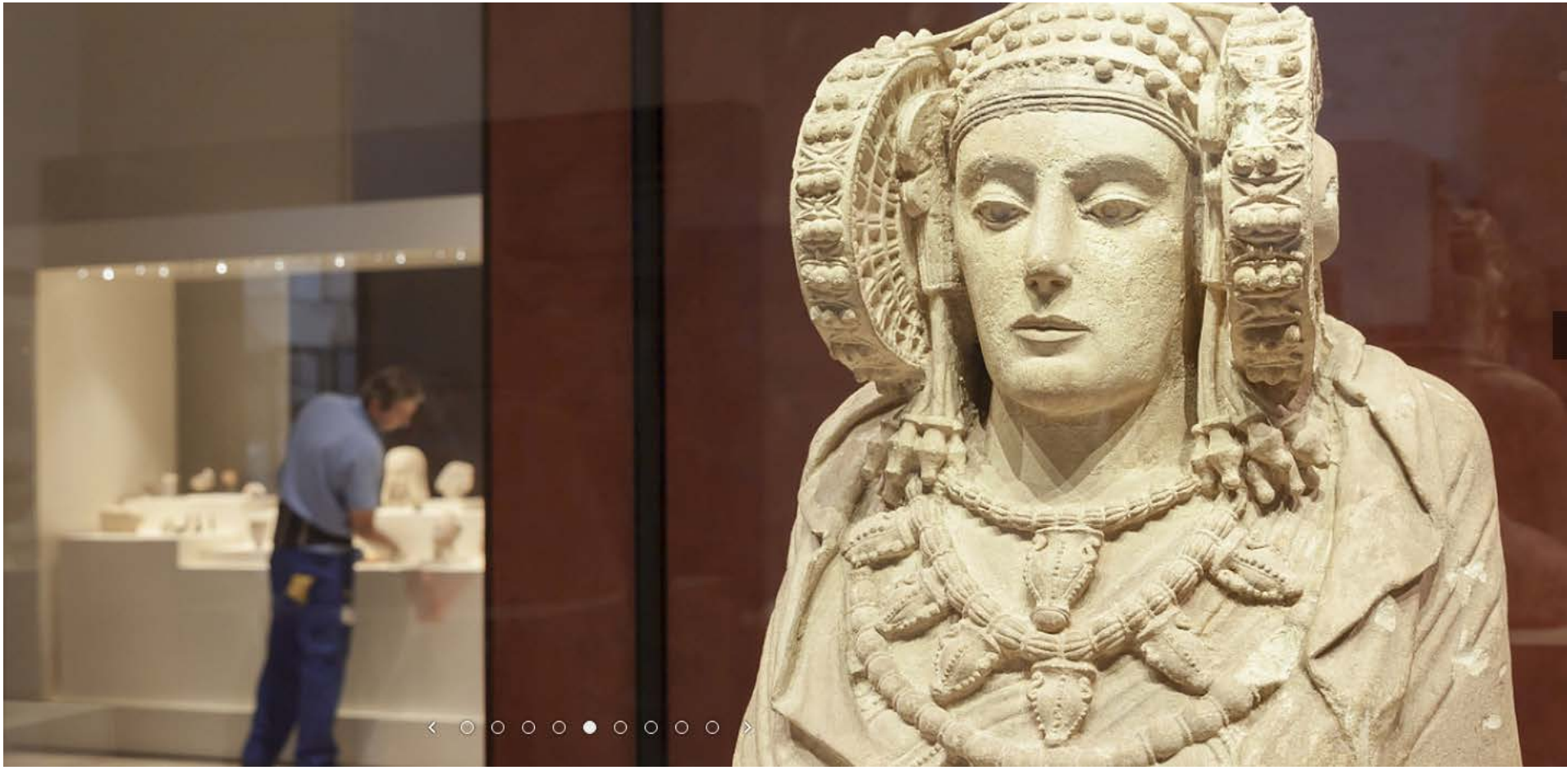
# 选择的要素:物体造型

- 为了物体造型，
- 光线的方向、角度，灯具的安装位置
- 多灯的强弱，避免平均用光
- 光和阴影的锐和柔



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# 选择的要素:阴影

- 需要阴影与消除阴影;
- 戏剧化效果与平和的视觉效果;
- 阴影比明亮更能体现设计师的个性;
- 用重点照明来造阴影，用一般照明来消阴影

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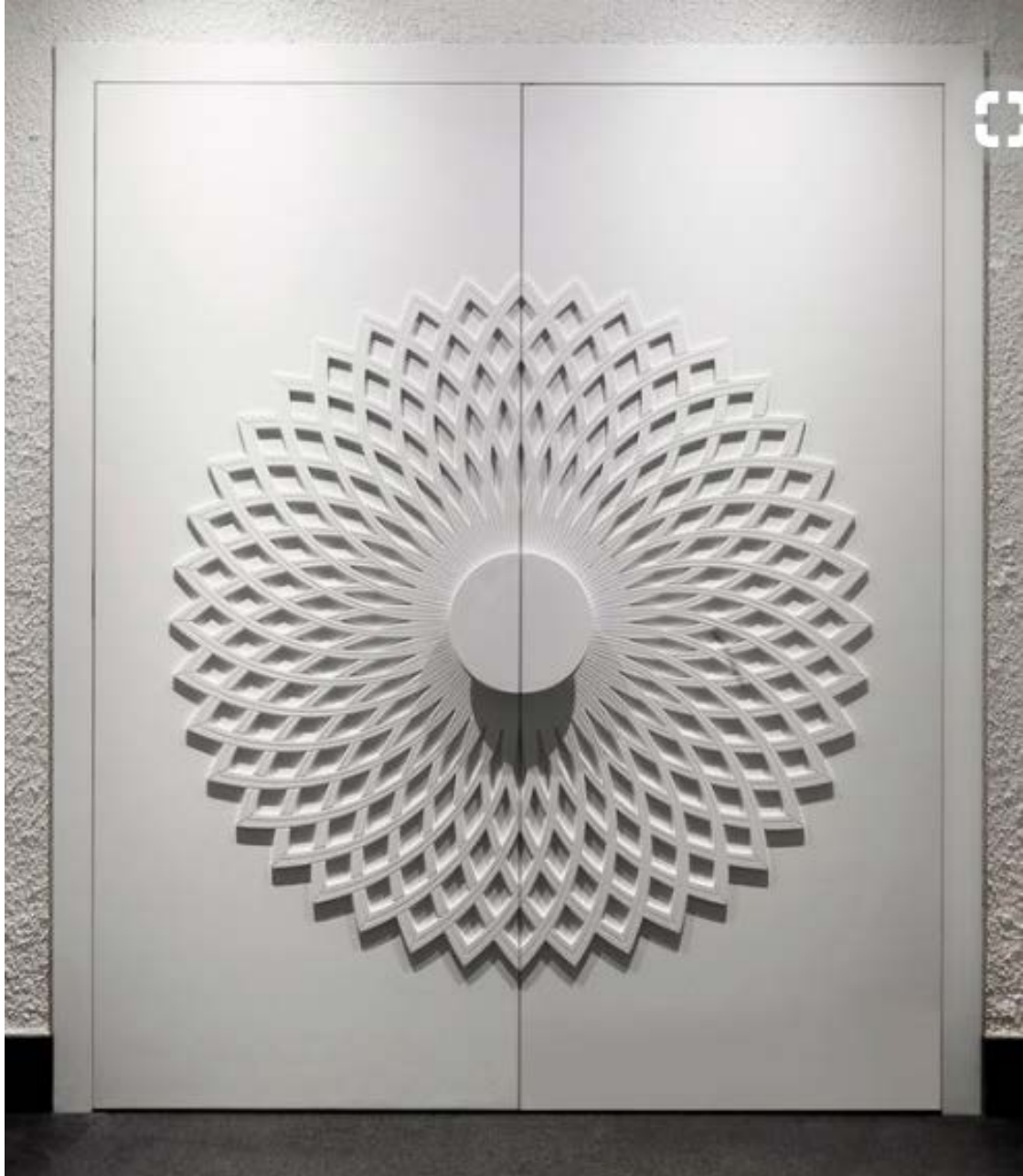

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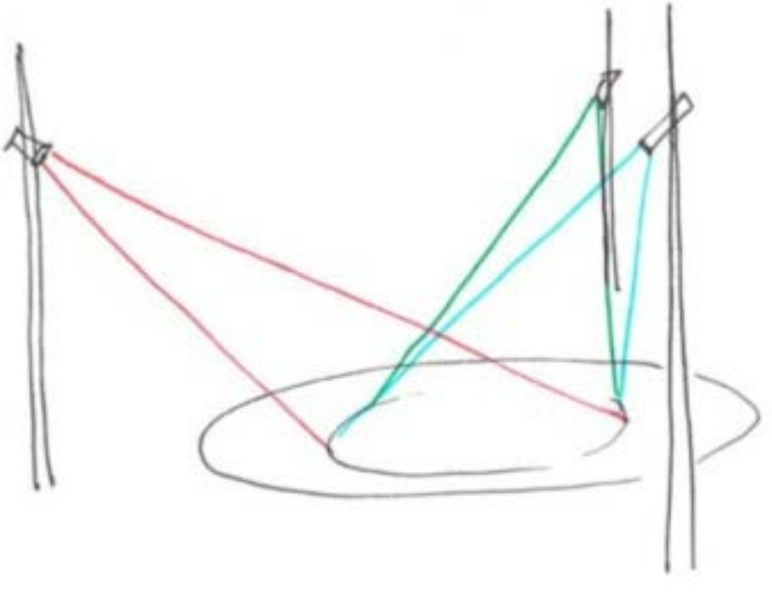

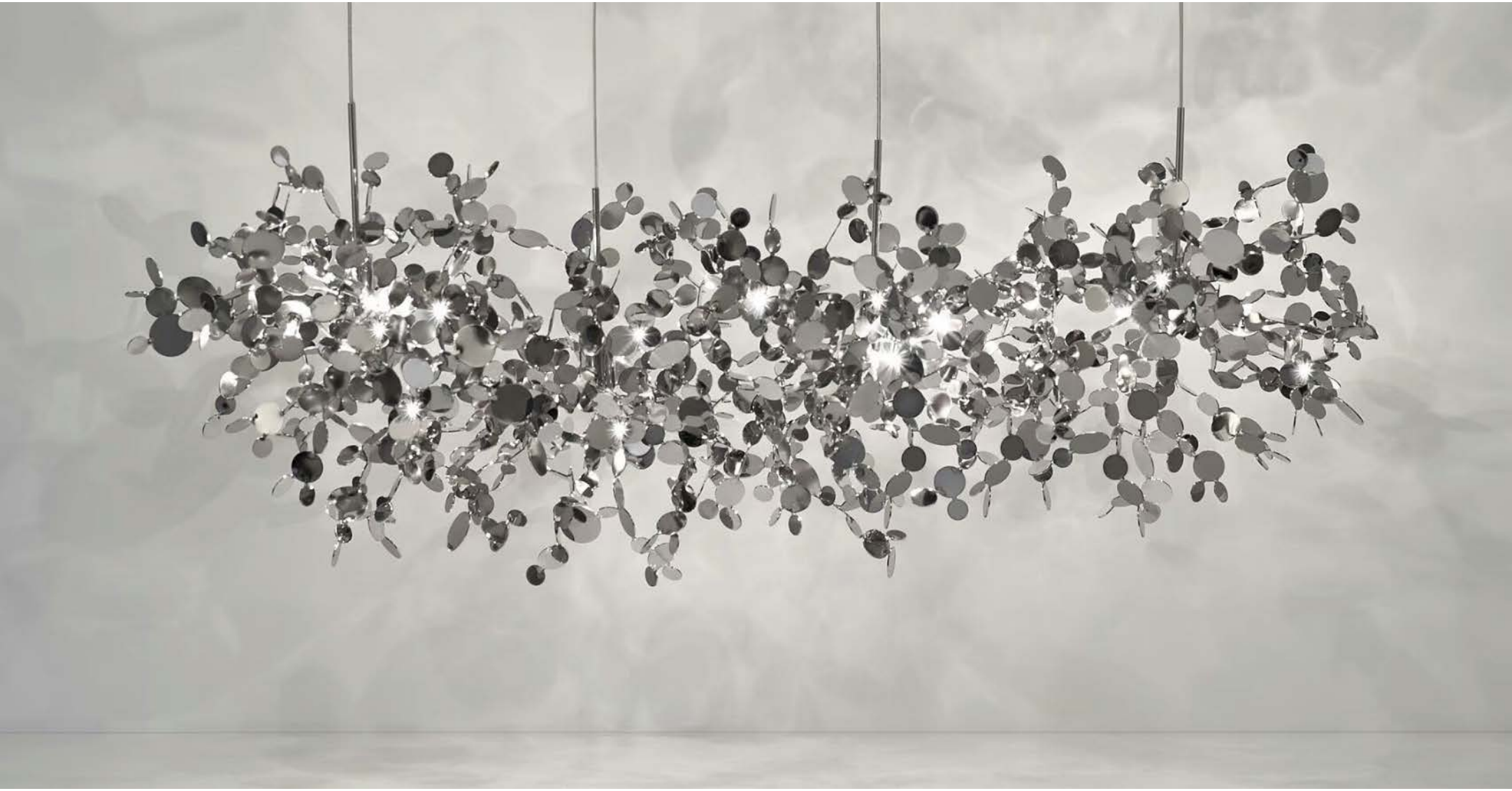

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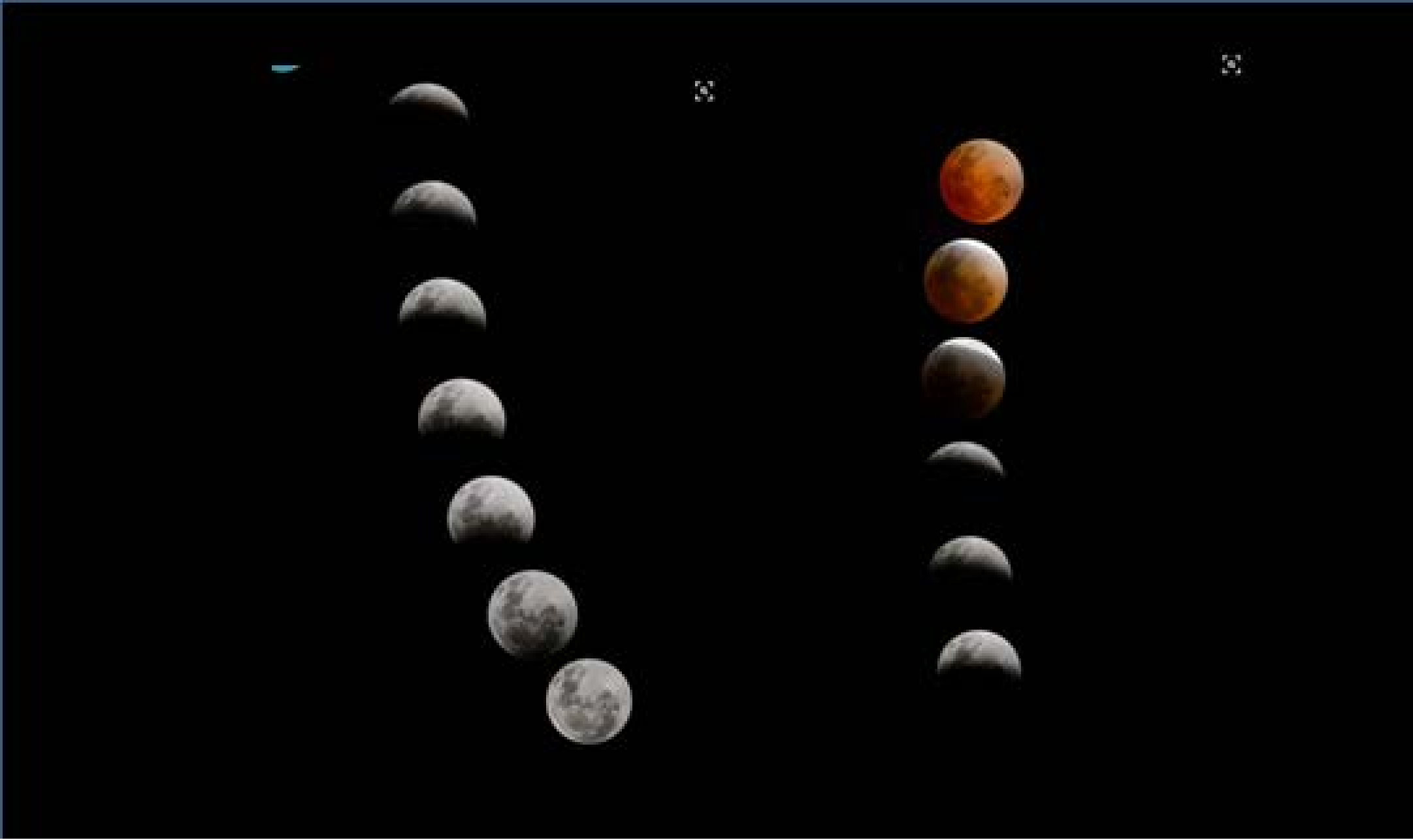
# 光的语言-用光阐述文化

色温 明暗 光影 角度大小 色彩 安装位置



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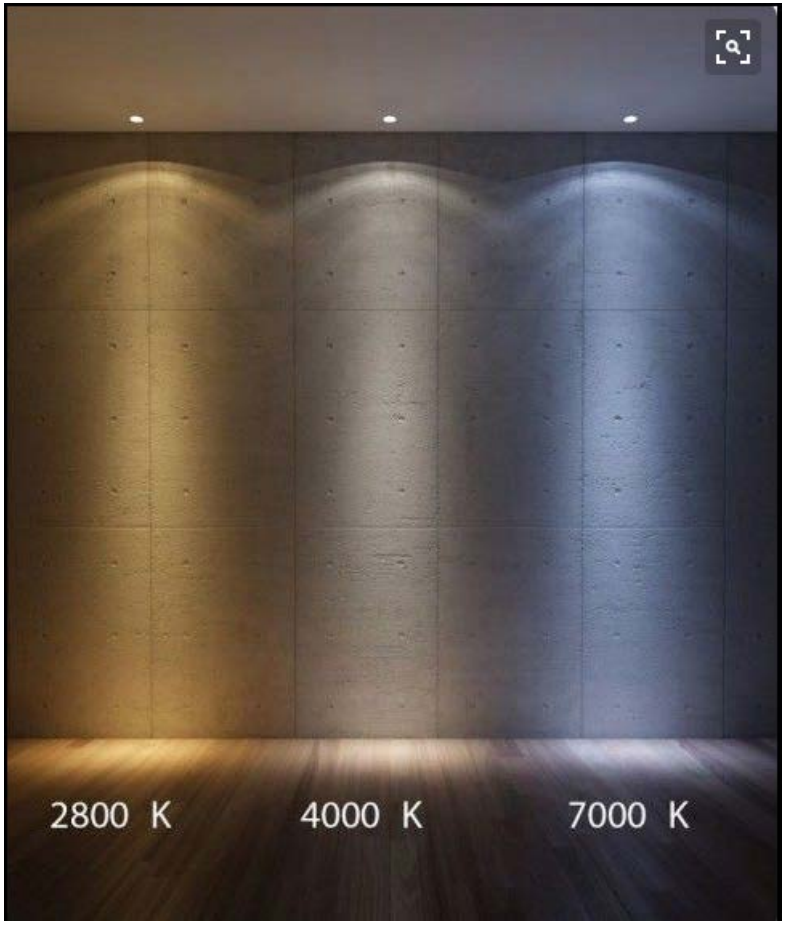
# 为什么选择不同的色温。。。跟色彩

波长的光作用与人的视觉器官以后，大脑必然导致对不同的色彩产生某种情感活动，同时由于经常观看自然界的色彩，视觉形成了心理积淀。不同的色彩会影响人们的情绪、性情和行动，而色彩的象征意义因不同的时代、民族、年龄、个人的修养和情绪的变化而又有不同。

1800K
match flame
1800K
10000K
1930K
candle flame
3500K
quartz lights
7500K
sky overcast
2900K
sunrise / sunset
5400K
sun direct at noon
8000K
outdoor shaded areas
3000K
Tungsten lamp 500W - 1KW
6500K
sun through clouds
10000K
partly cloudy sky


2800 K
4000 K
7000 K

色温

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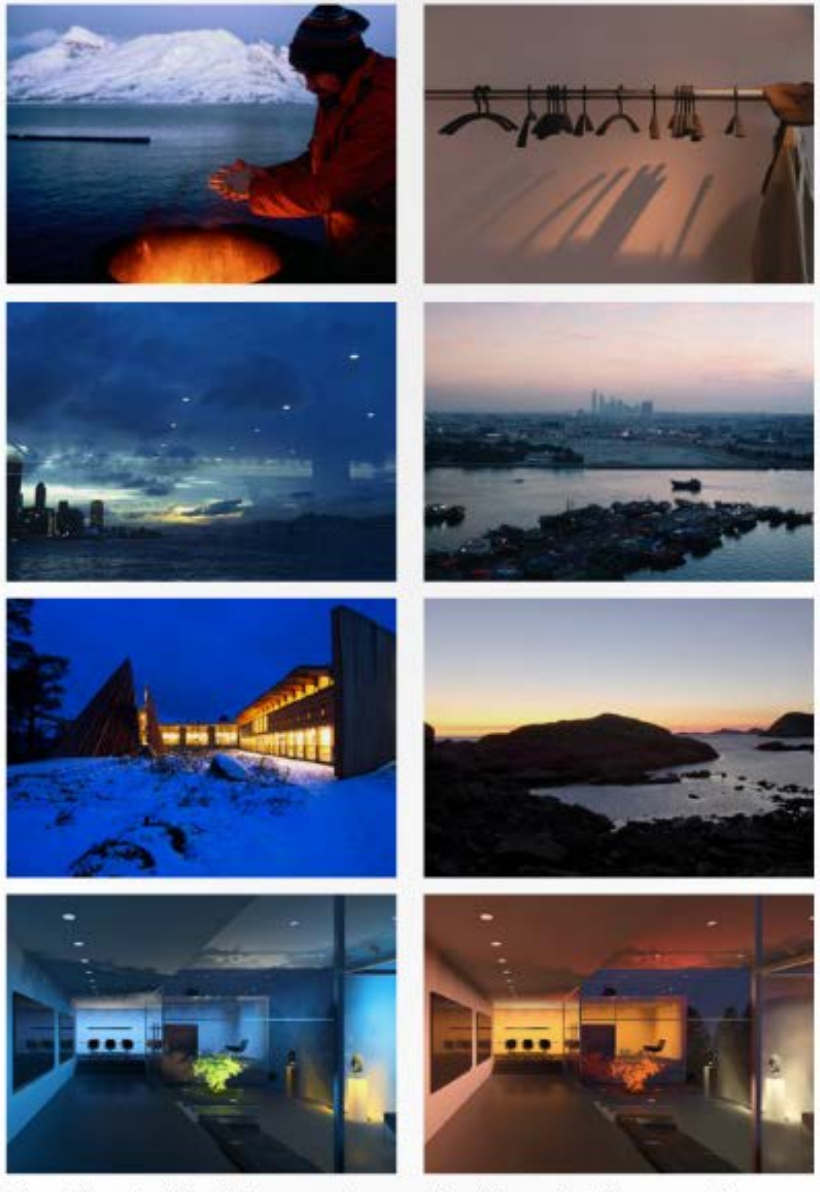

The mood board is a collection of pictures, sketches, materials, colours, and terms to describe emotions. Where different moods are required as special effects in a room, parallel collages with diverse themes can be used to underline the statements on contrasts and colours for the different light scenes. While the mood board initially focuses on a broad collection of pictures, the process of evaluation and concentration is more analytical.

Mood board with diffuse, cool light

Mood board with warm, directional light

# 色温

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赤、橙、黄、绿、青、蓝、紫等各种色彩，明暗程度的不同。由于人的生理特点和人的社会生活经验以及知觉、联觉、联想等原因，对各种色彩会产生出不同的心理反应。这就是色彩的特性。

**冷暖感**——凡倾向于红、橙、黄的色相，给人以温暖感：凡倾向于青、蓝、绿的色相，给人以寒冷感。

**胀缩感**——明度高的暖色给人以向外散射和膨胀之感，明度低的冷色给人以向内收聚和紧缩之感。

**动静感**——纯度高的暖色给人以动感和兴奋感，而纯度低的冷色给人以沉静和安定感。

**轻重感**——明度高的色彩给人以轻飘感，明度低的色彩给人沉重感。

**软硬感**——高明度色彩给人以柔软感，低明度的色彩给人以坚硬感。

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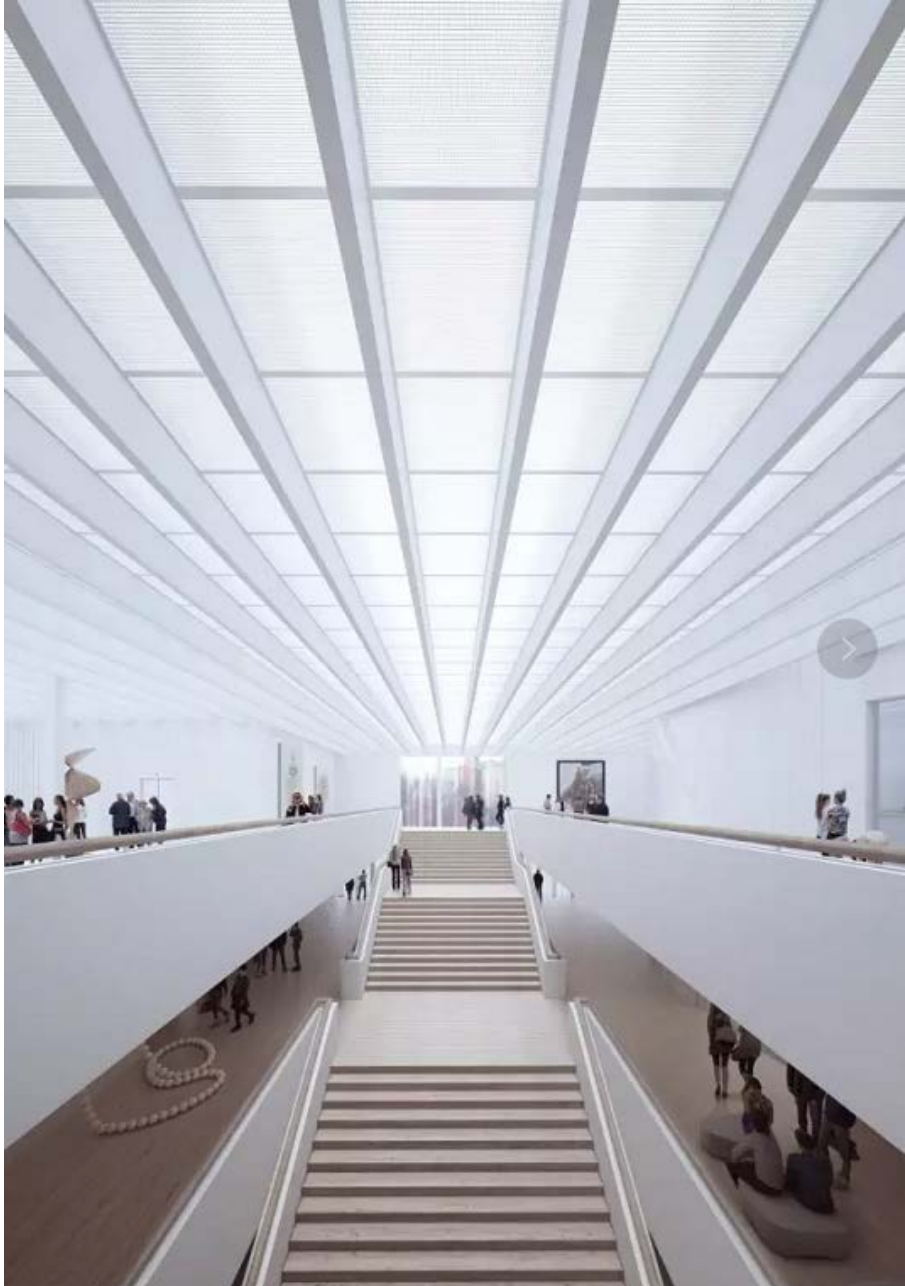

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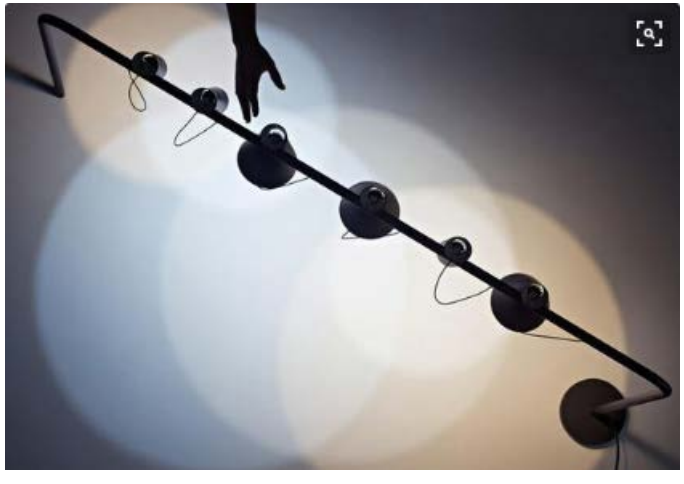
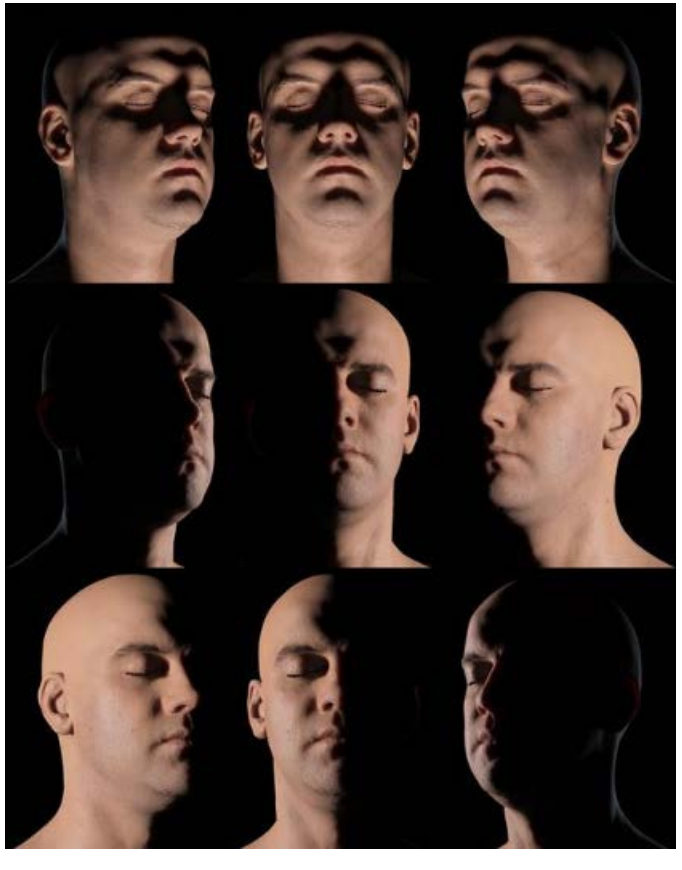
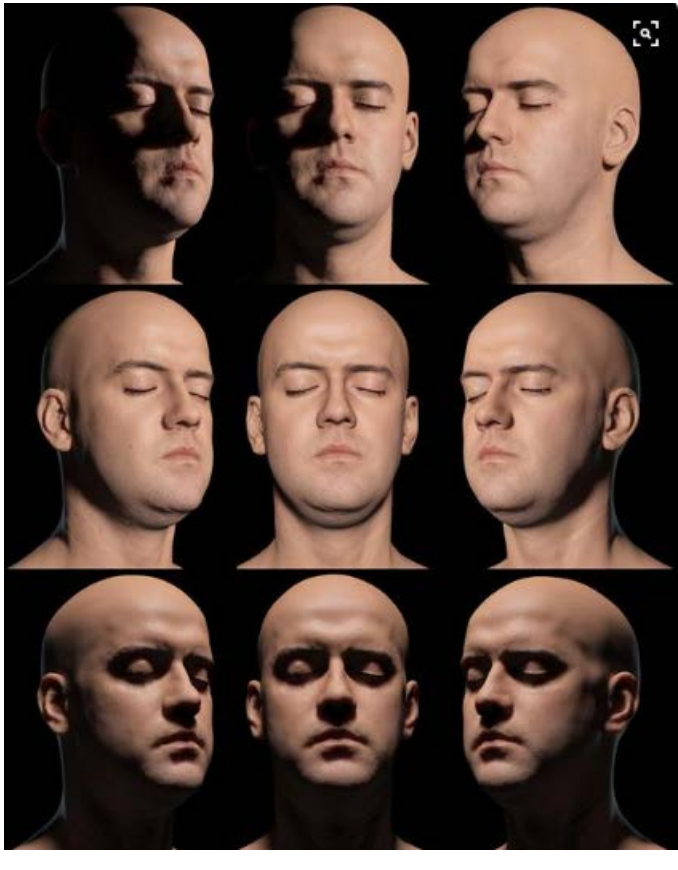
- 红色：兴奋、激动、欢乐、危险、紧张、恐怖 喜庆 过节 等
- 橙色：渴望、健康、跃动、成熟、向上、等
- 黄色：光明、轻快、丰硕、温暖、轻薄、颓废等
- 绿色：生命、青春、成长、安静、满足等
- 蓝色：深远、纯洁、冷静、沉静、悲痛、压抑等蓝调
- 紫色：庄严、幽静、伤痛、神秘等
- 黑色：深沉、庄严、阴森、沉默、凄凉等
- 白色：纯洁、朴素、轻盈、单薄、哀伤等
- 灰色：平淡、沉闷、寂寞、含蓄、高雅、安适等







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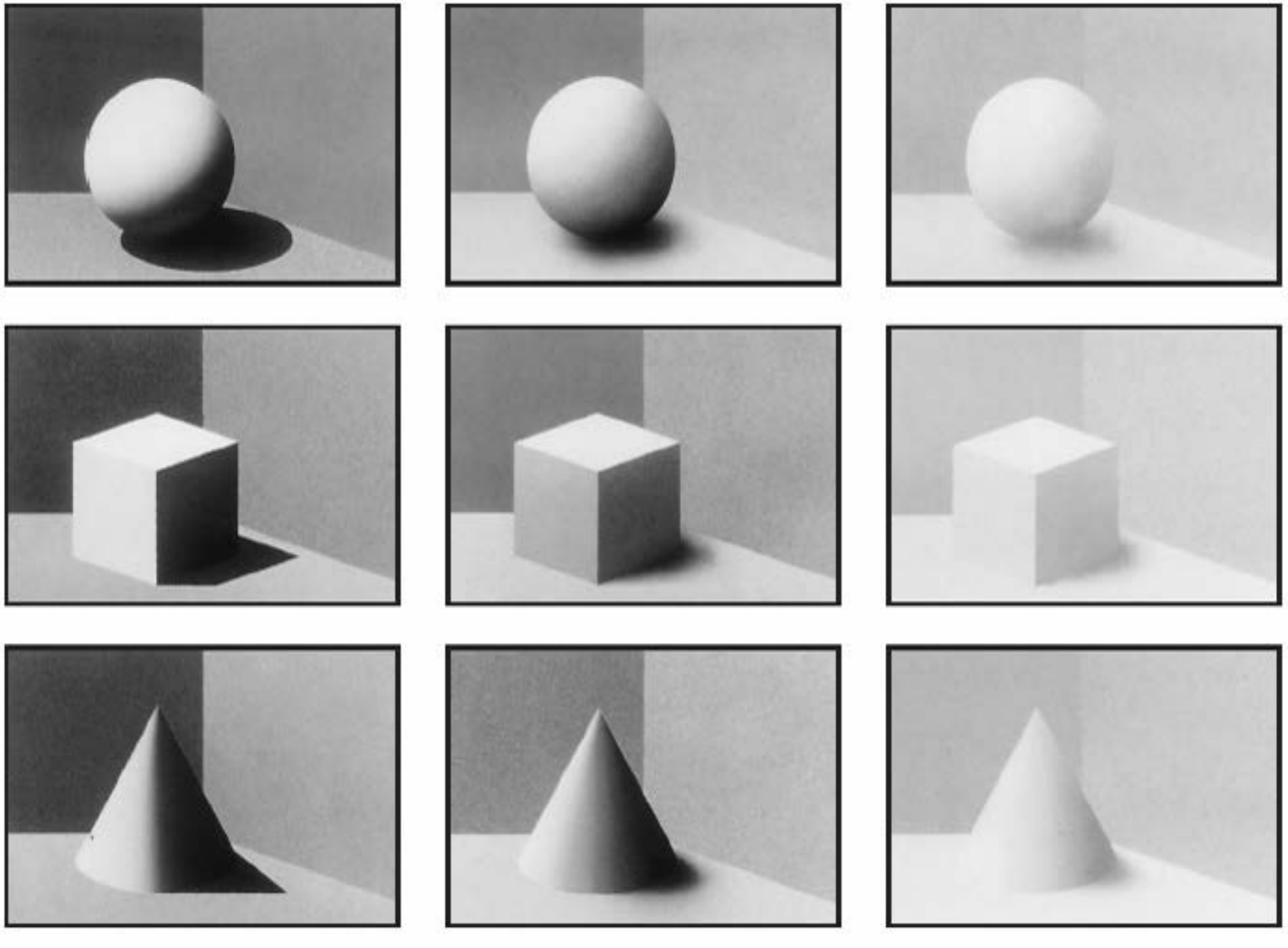

•不同的亮度比，给我们的视觉感官带来不一样的氛围。

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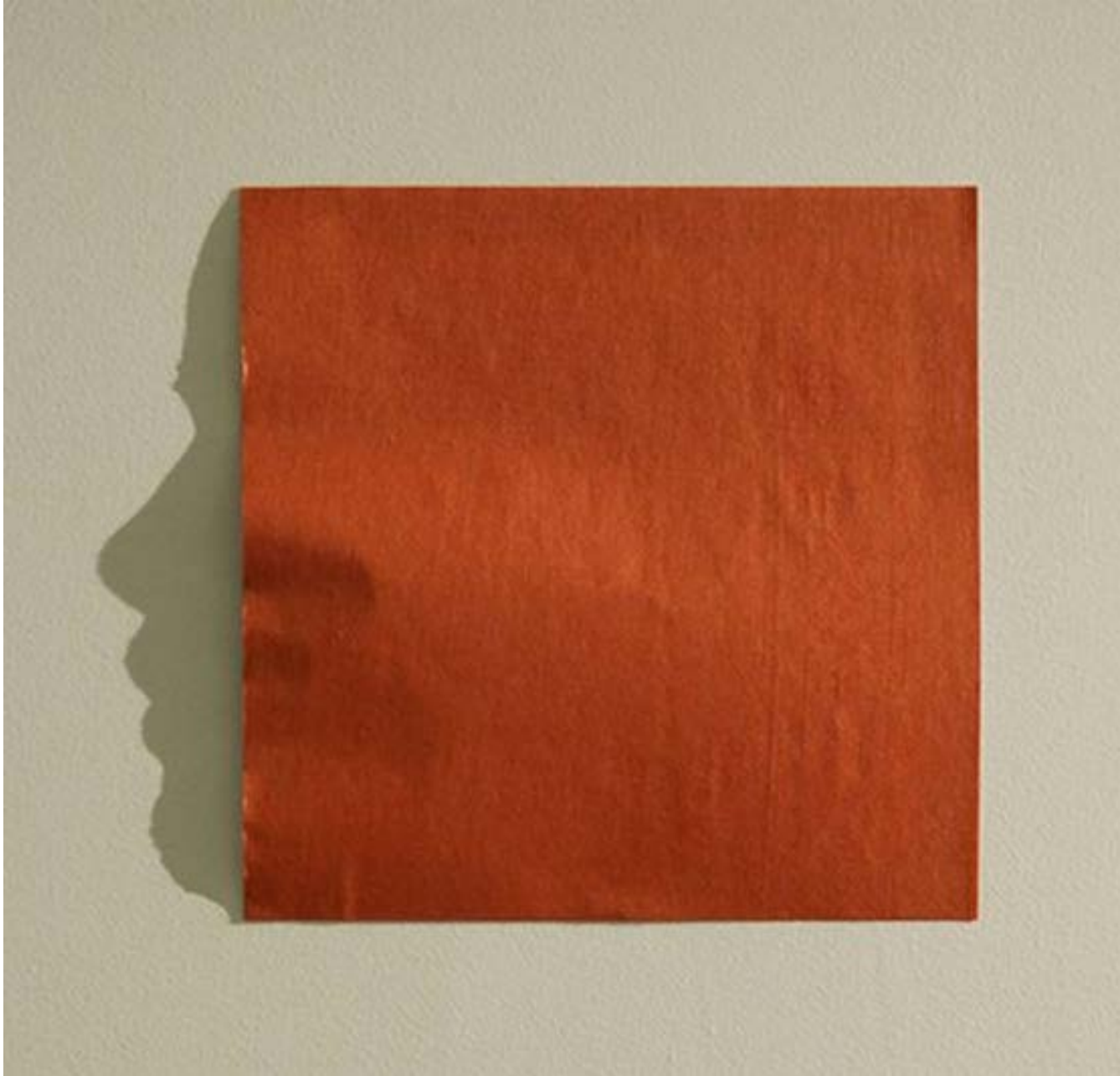

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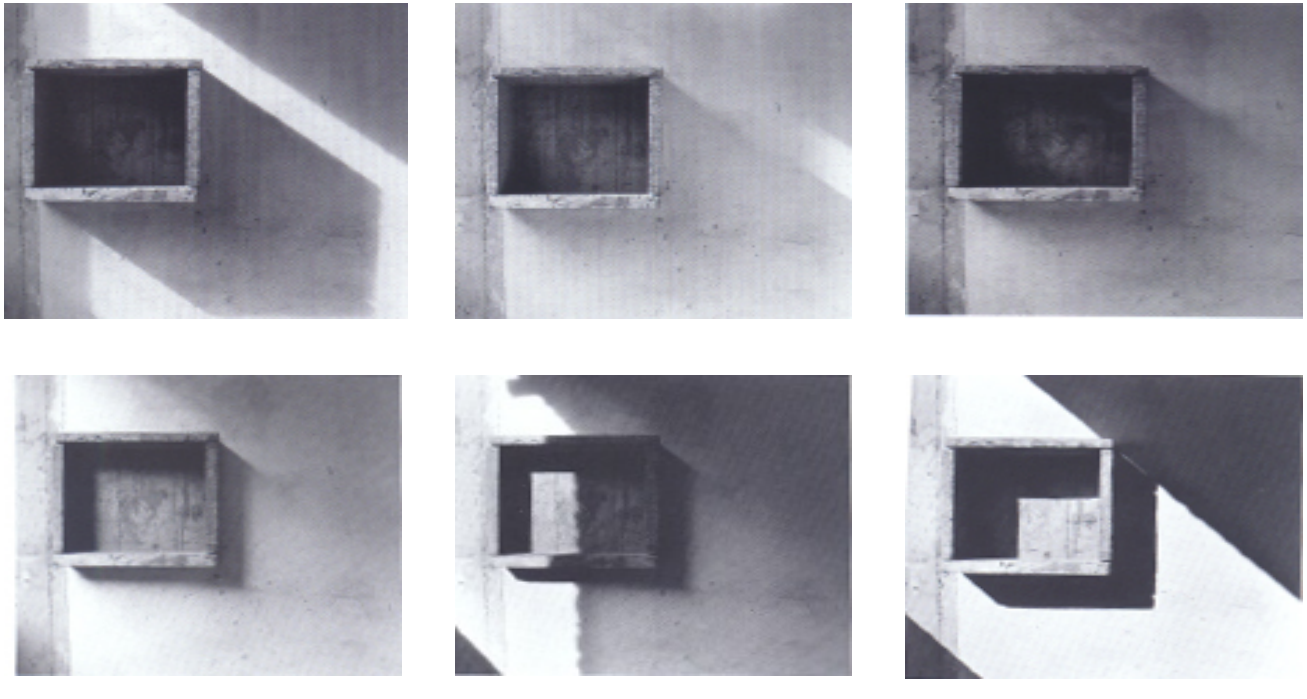

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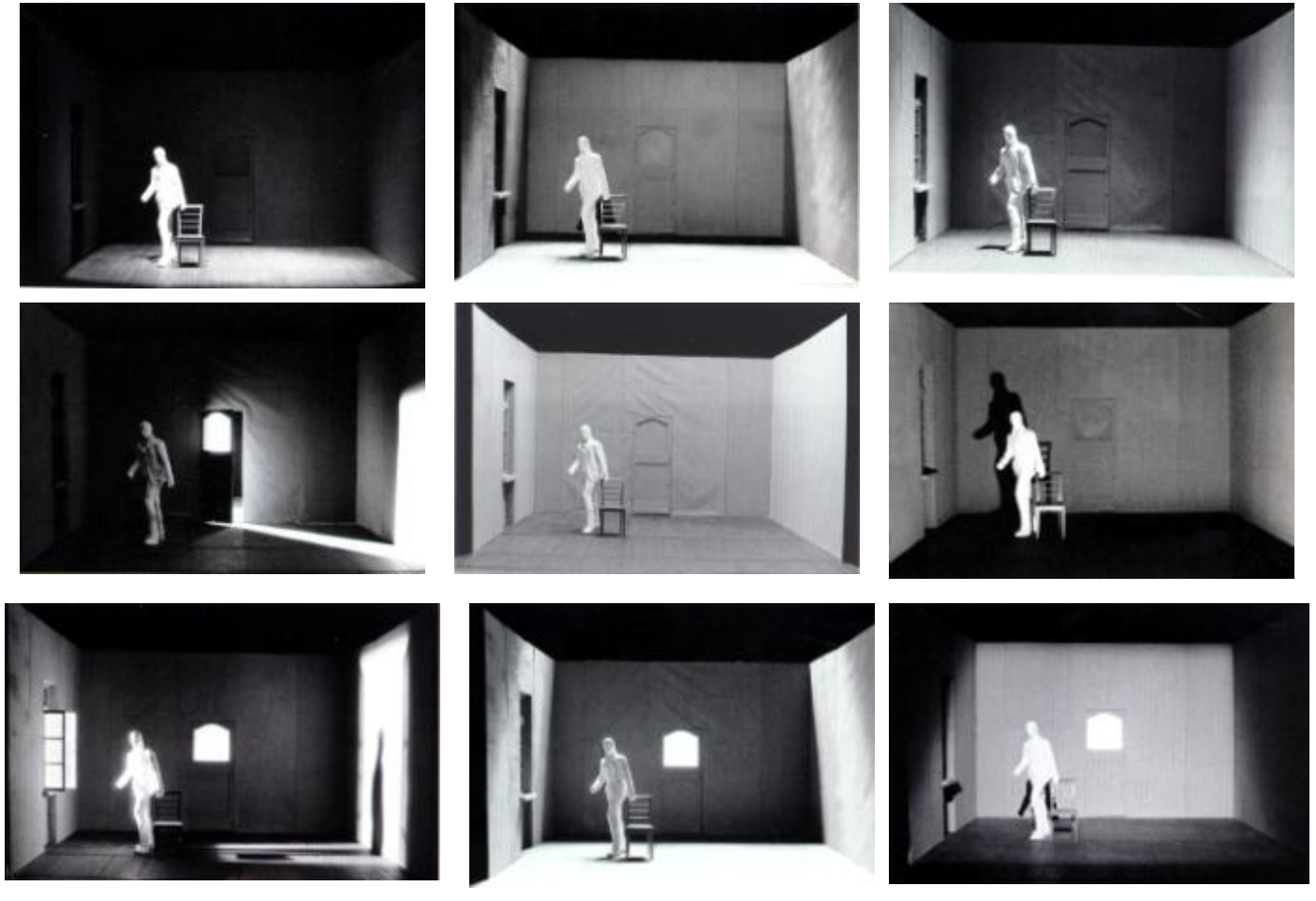

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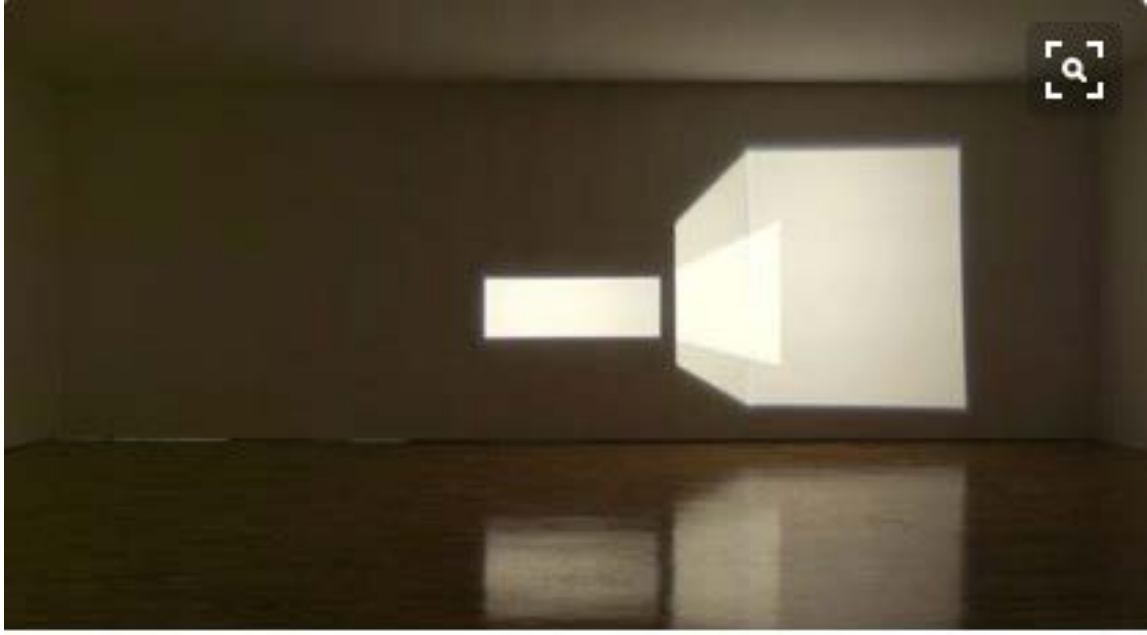

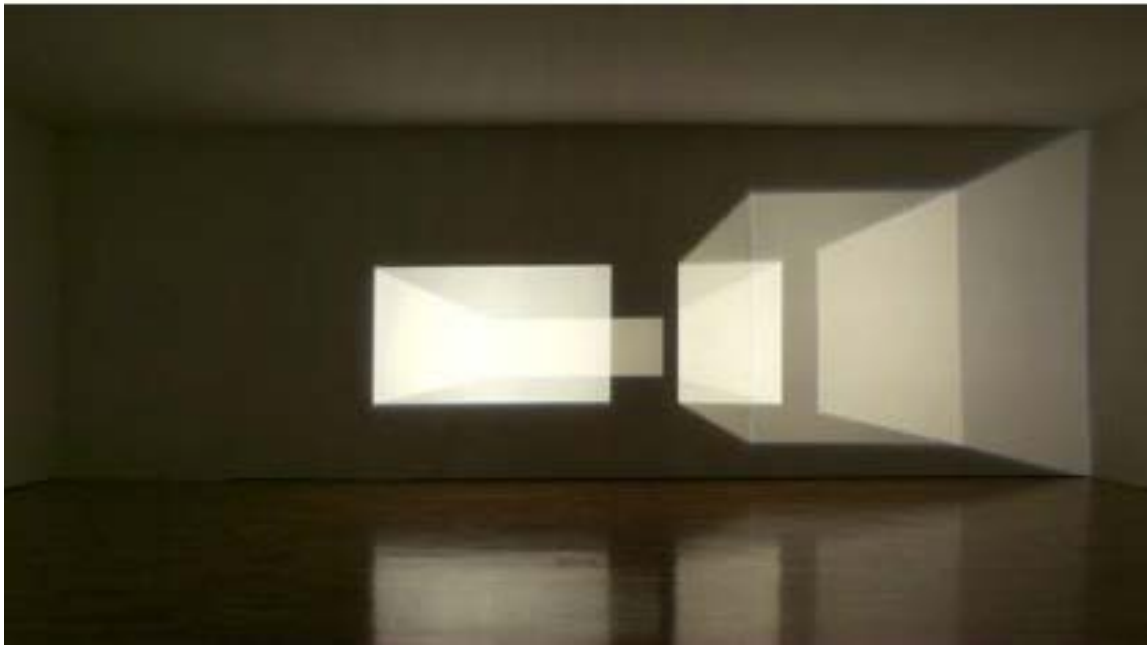

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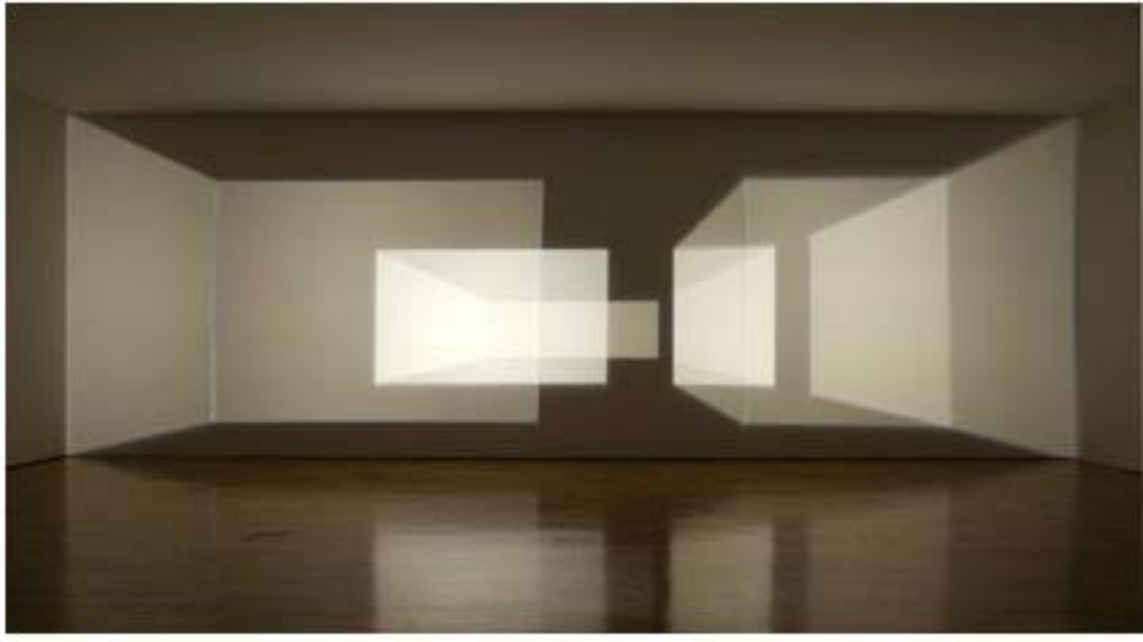
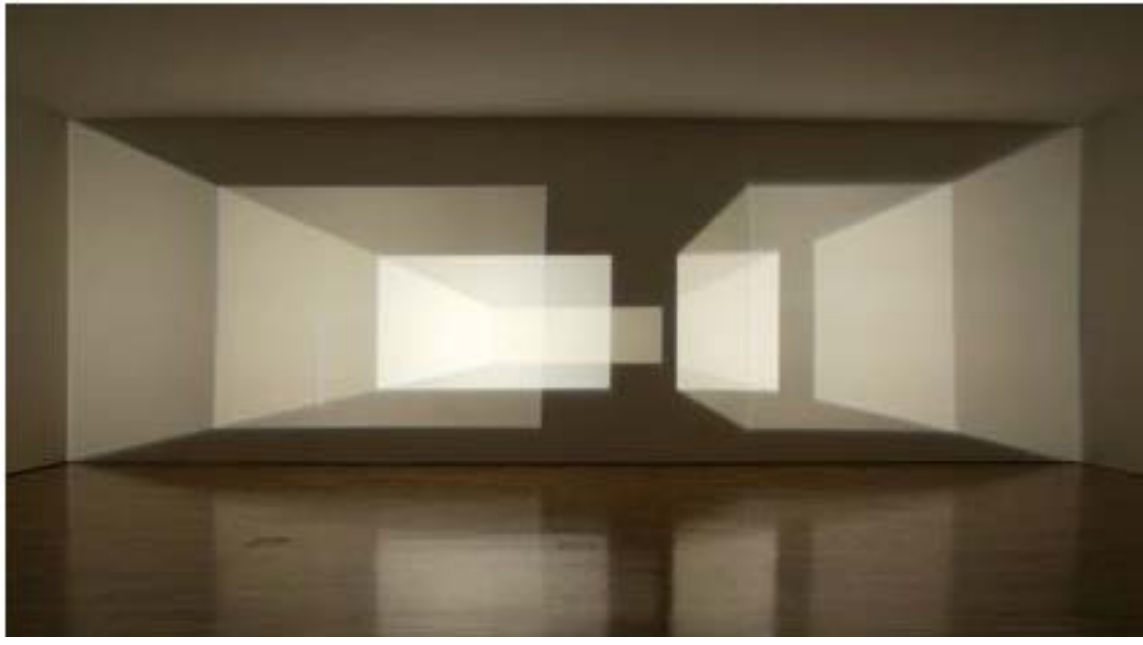
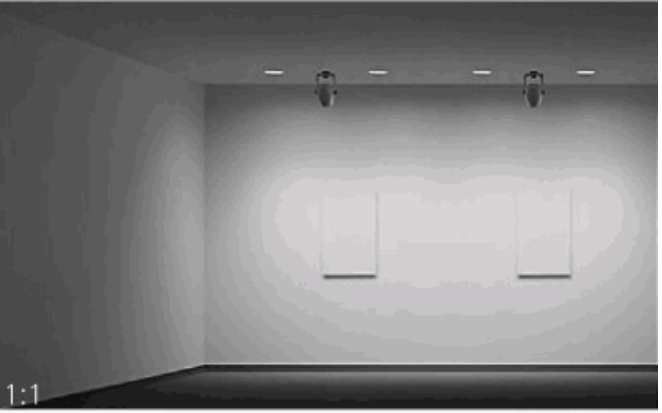
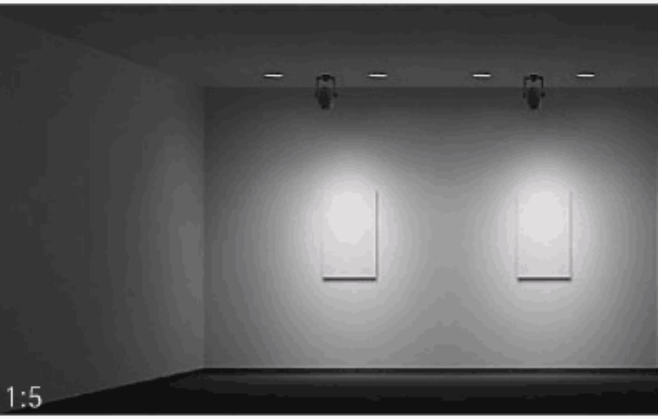
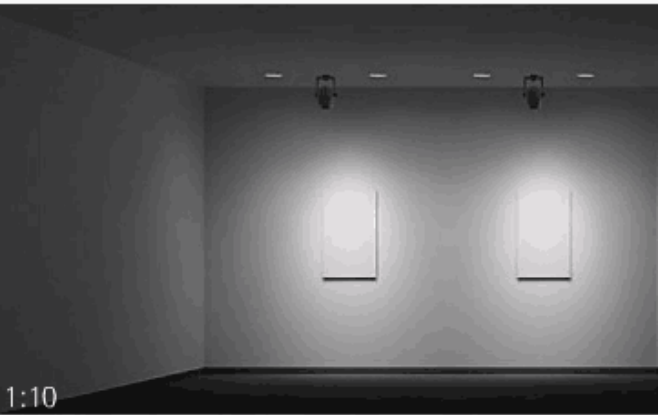




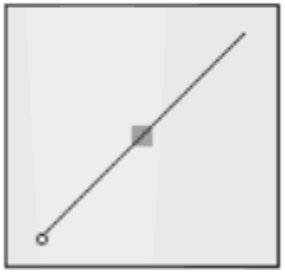


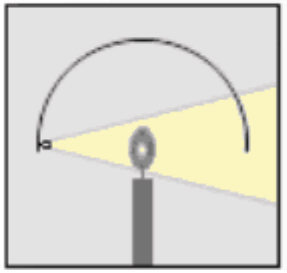



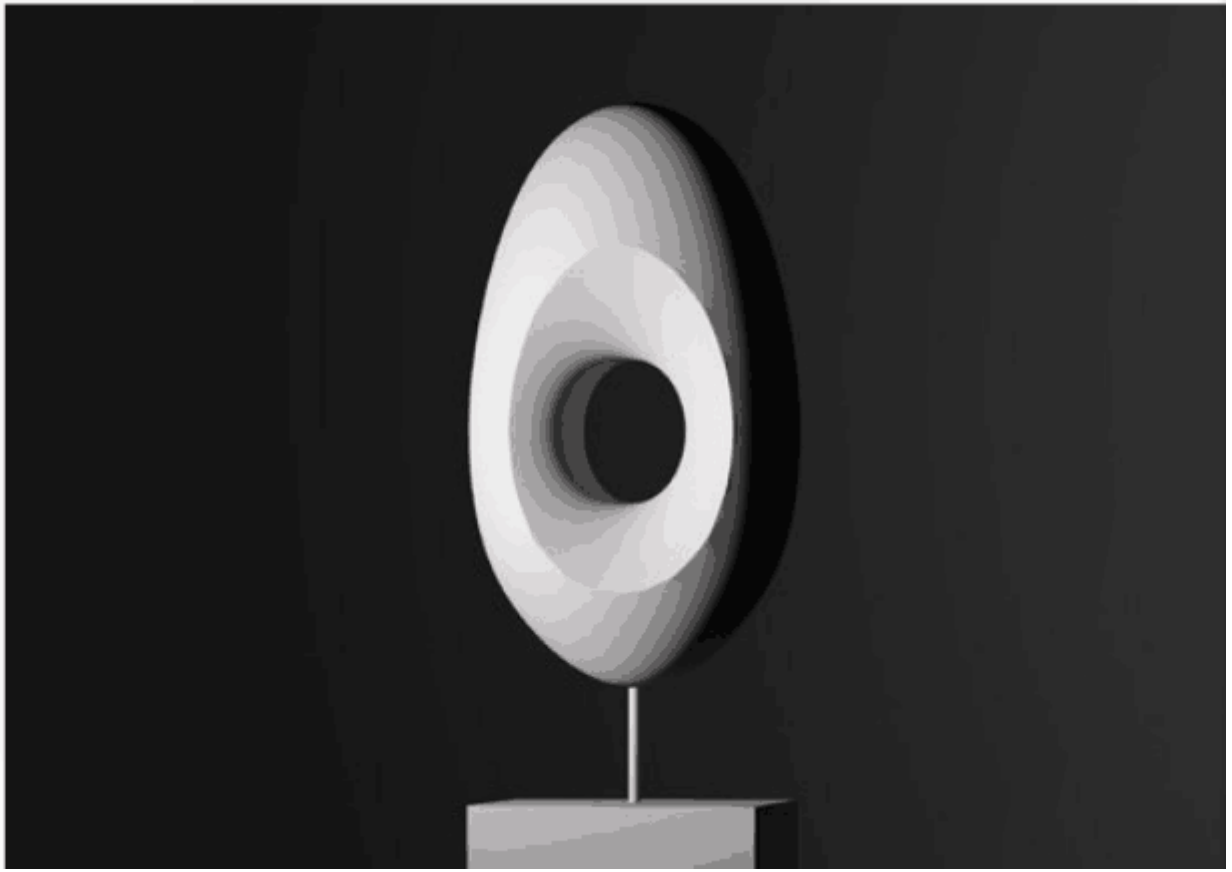



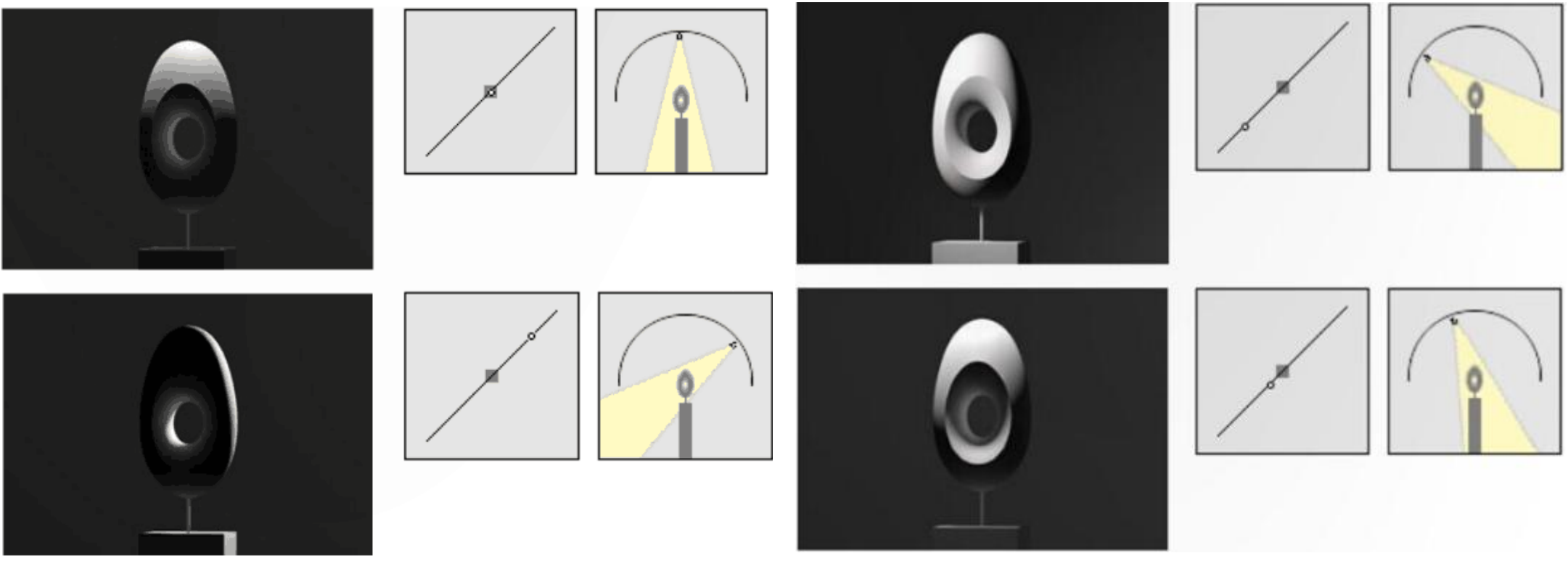

•不同的照度比，给我们的视觉感官带来不一样的氛围。

# Observation









# 光的方向

常规角度

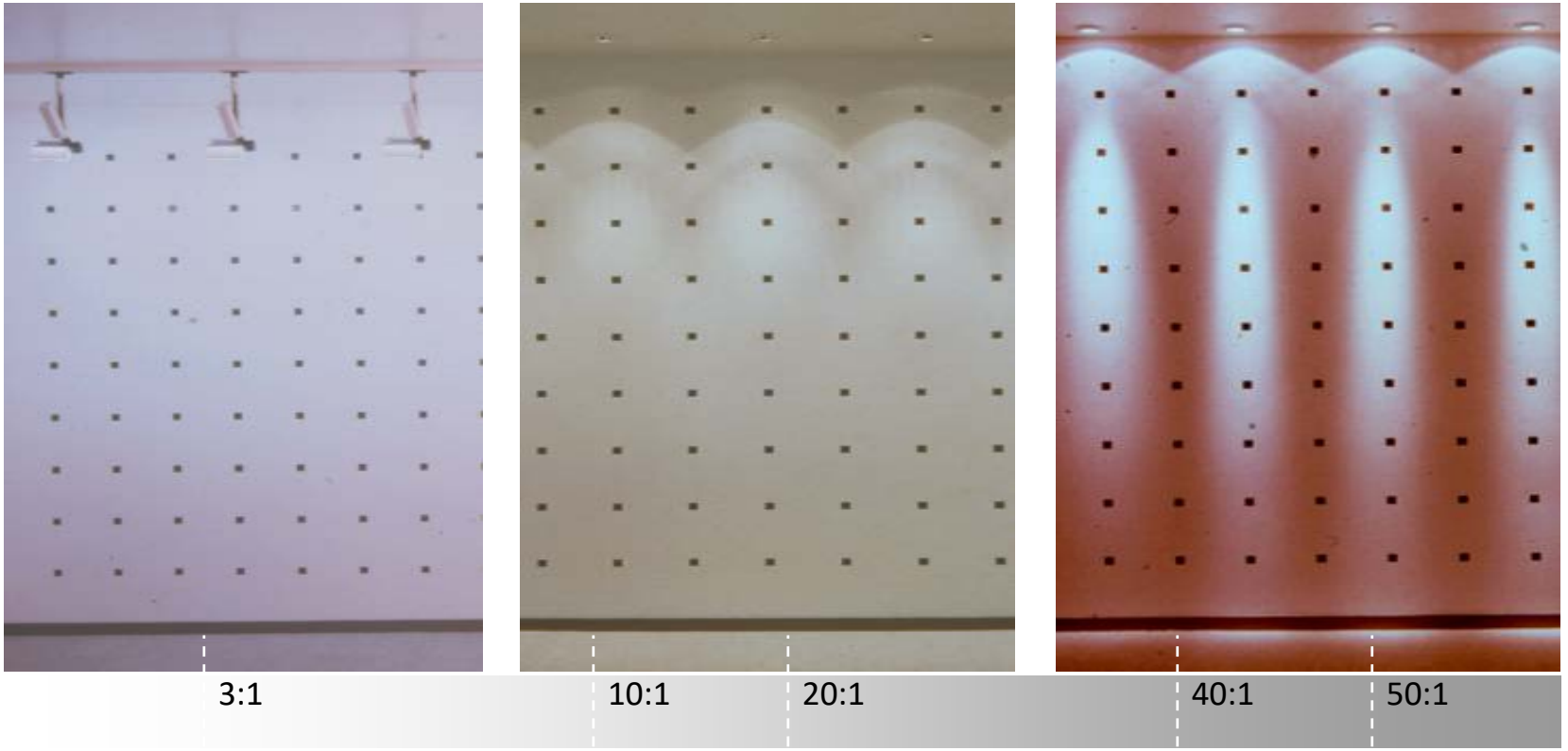
侧光

下射光

# 立体感

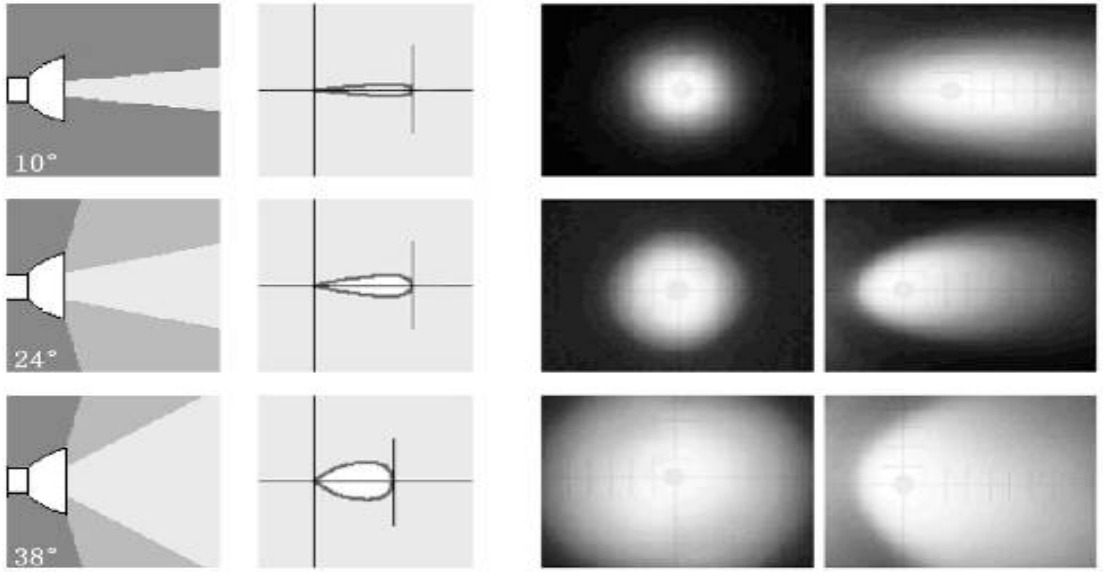
弱

强


3:1
10:1
20:1
40:1
50:1
几乎不能察觉的
刚刚能够察觉
微妙的变化
适中的
比较强
强的
富有戏剧性变化
使人惊奇的

# 光束角

光束角指的是灯具光线的角度




- 灯杯的角度一般常见的有10°、24°、38°3种。左图是3个功率完全相同只是光束角不同的3个灯杯照射在墙面的效果，以及3种光束角的配光曲线示意图。

- 相同功率的灯杯光束角越大其中心光强越小，出来的光斑越宽越柔和，相反光束角越小其中心光强越大，出来的光斑越窄越生硬。

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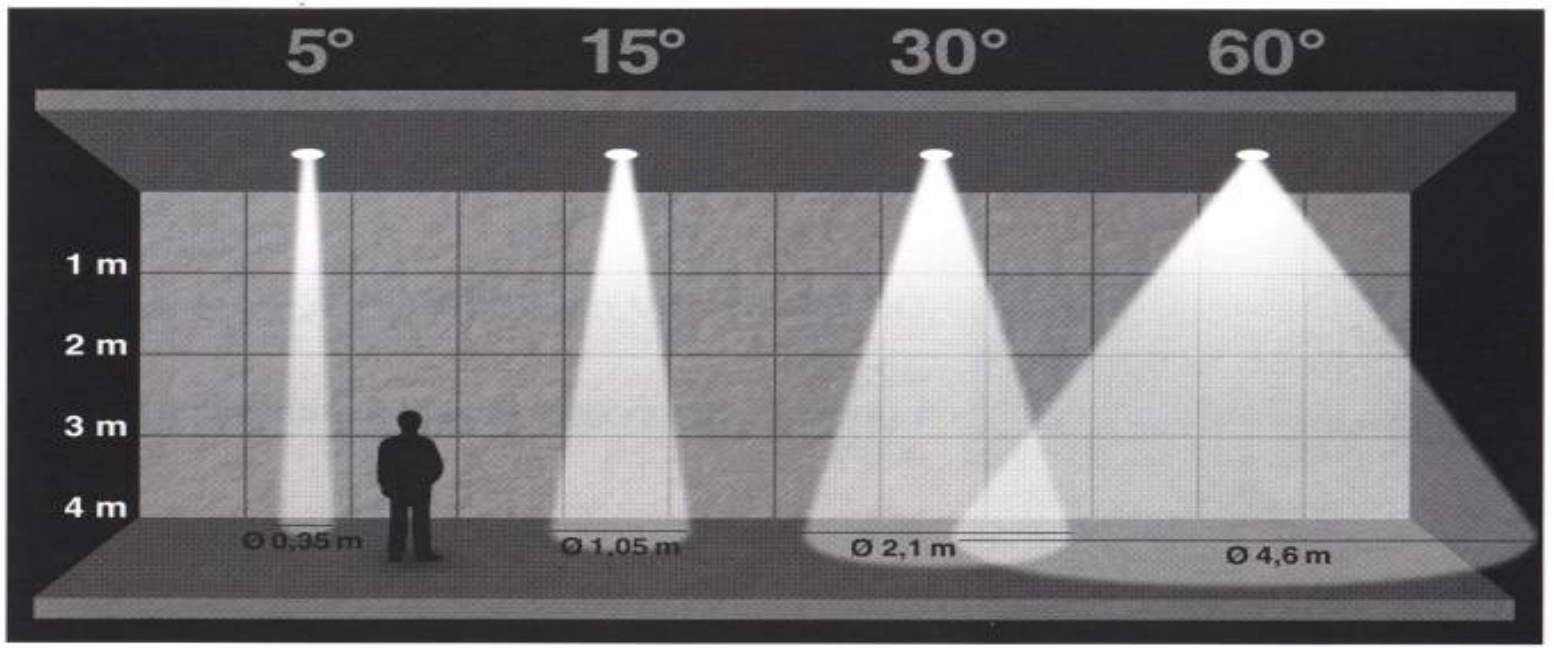
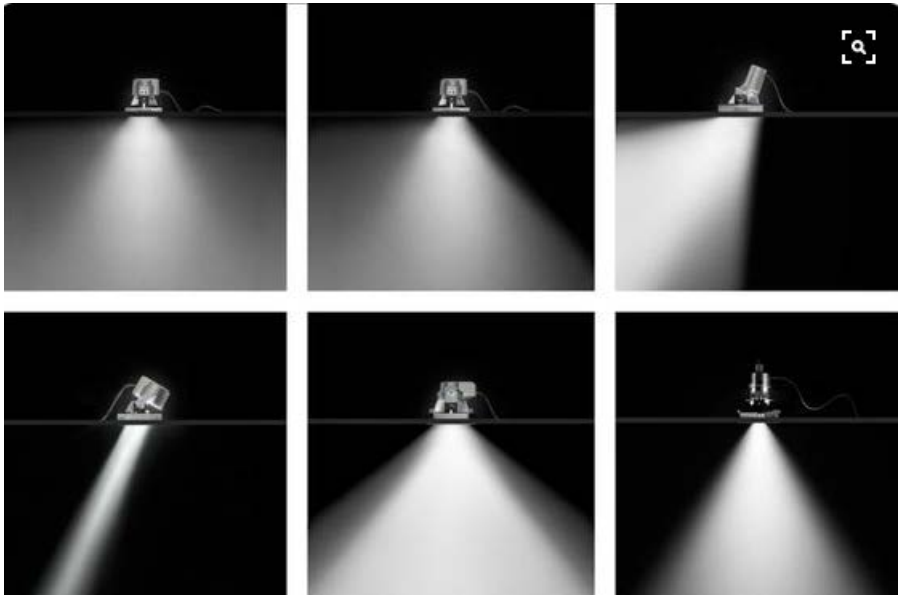



•根据空间的高度及被照物体的面积大小来选择合适的角度。严格避免向不需要投射的地方外溢光



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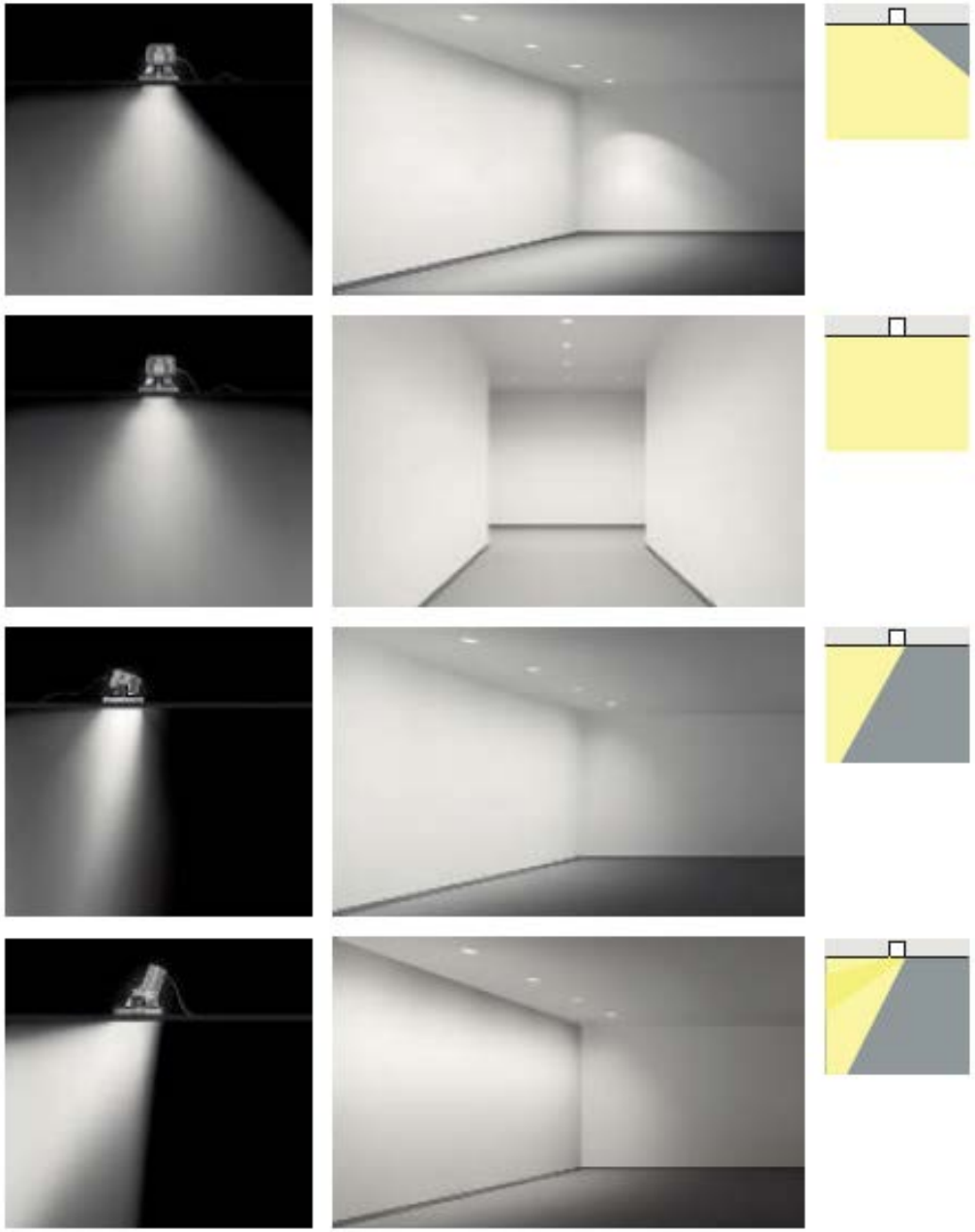

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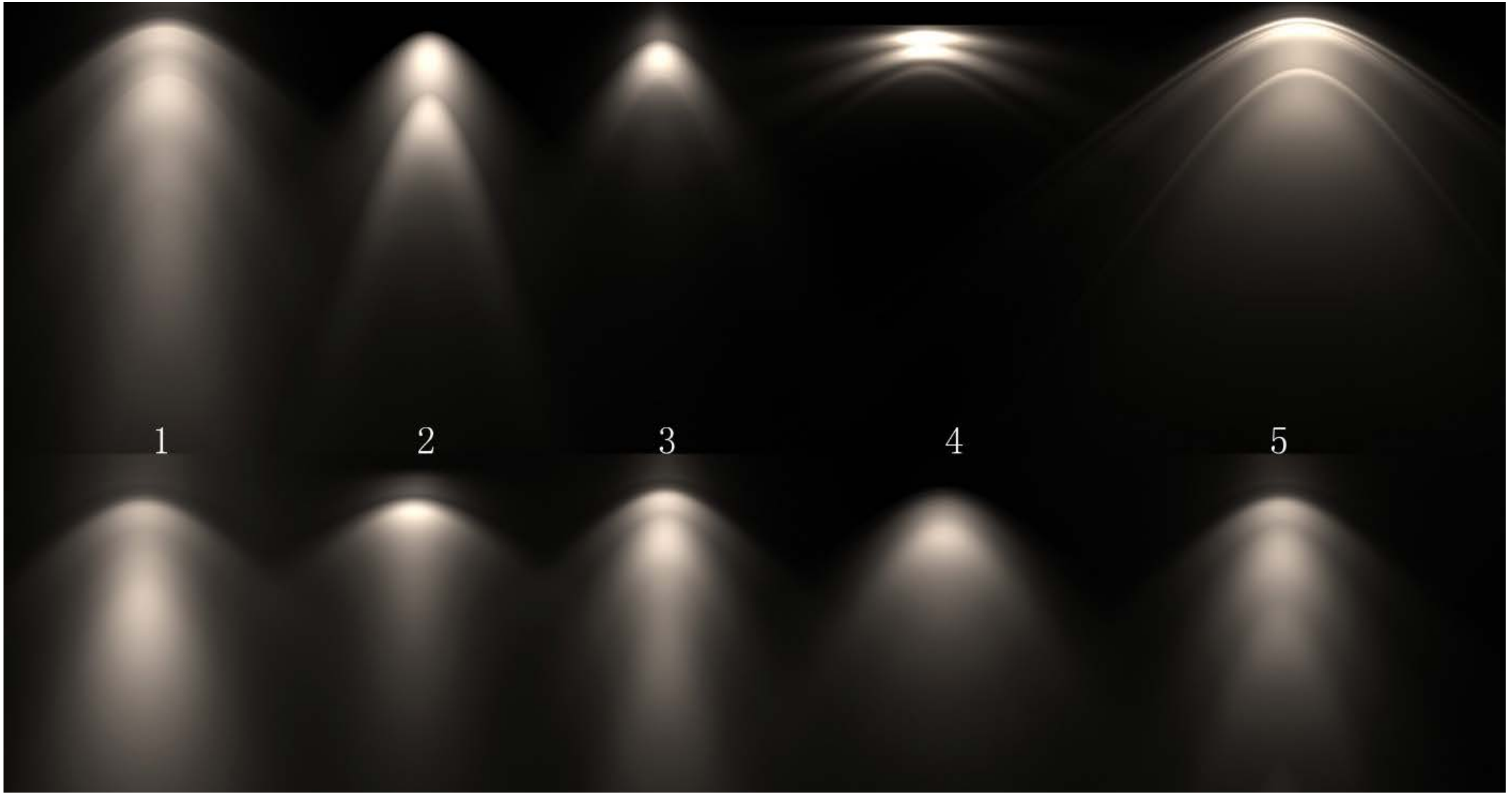
1
2
3
4
5

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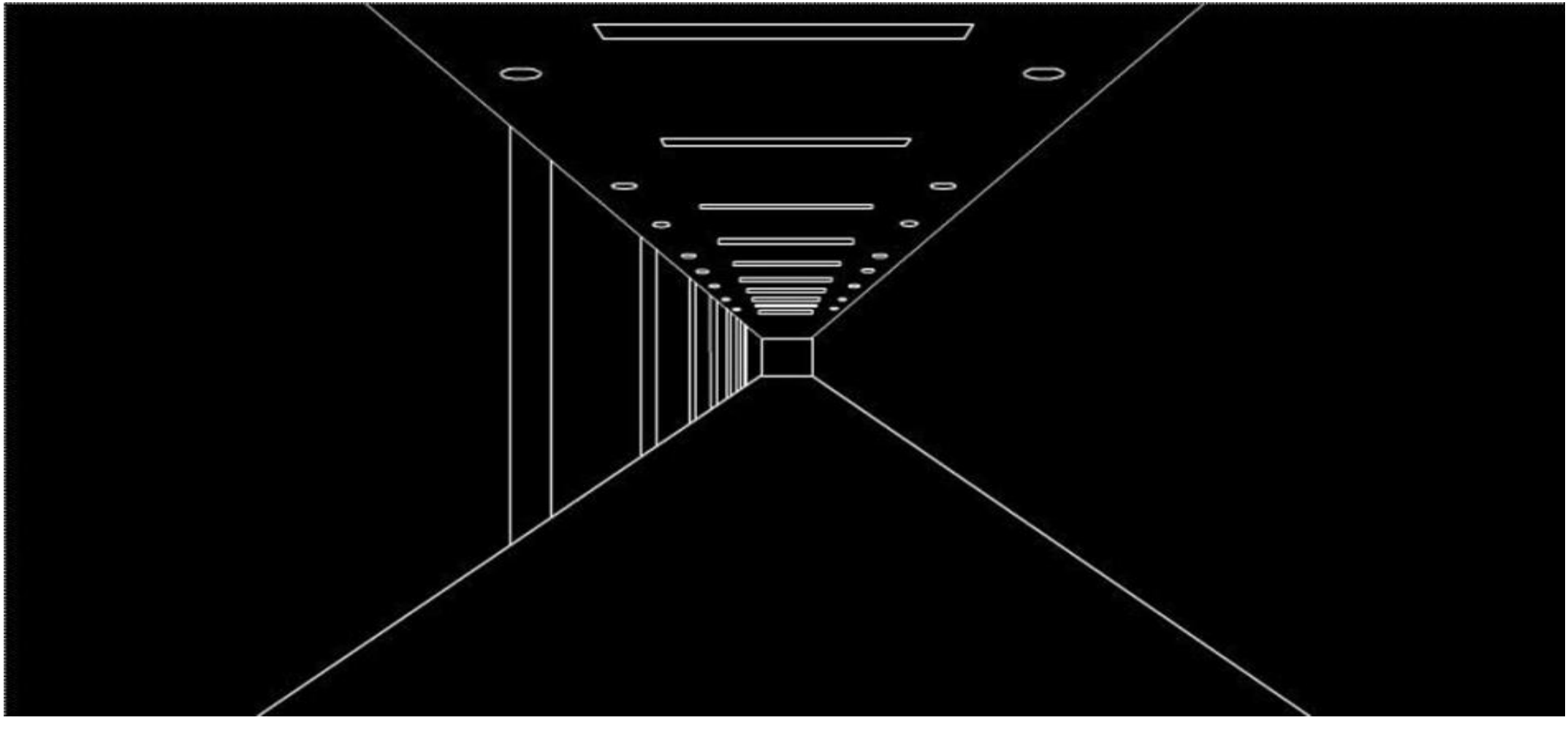
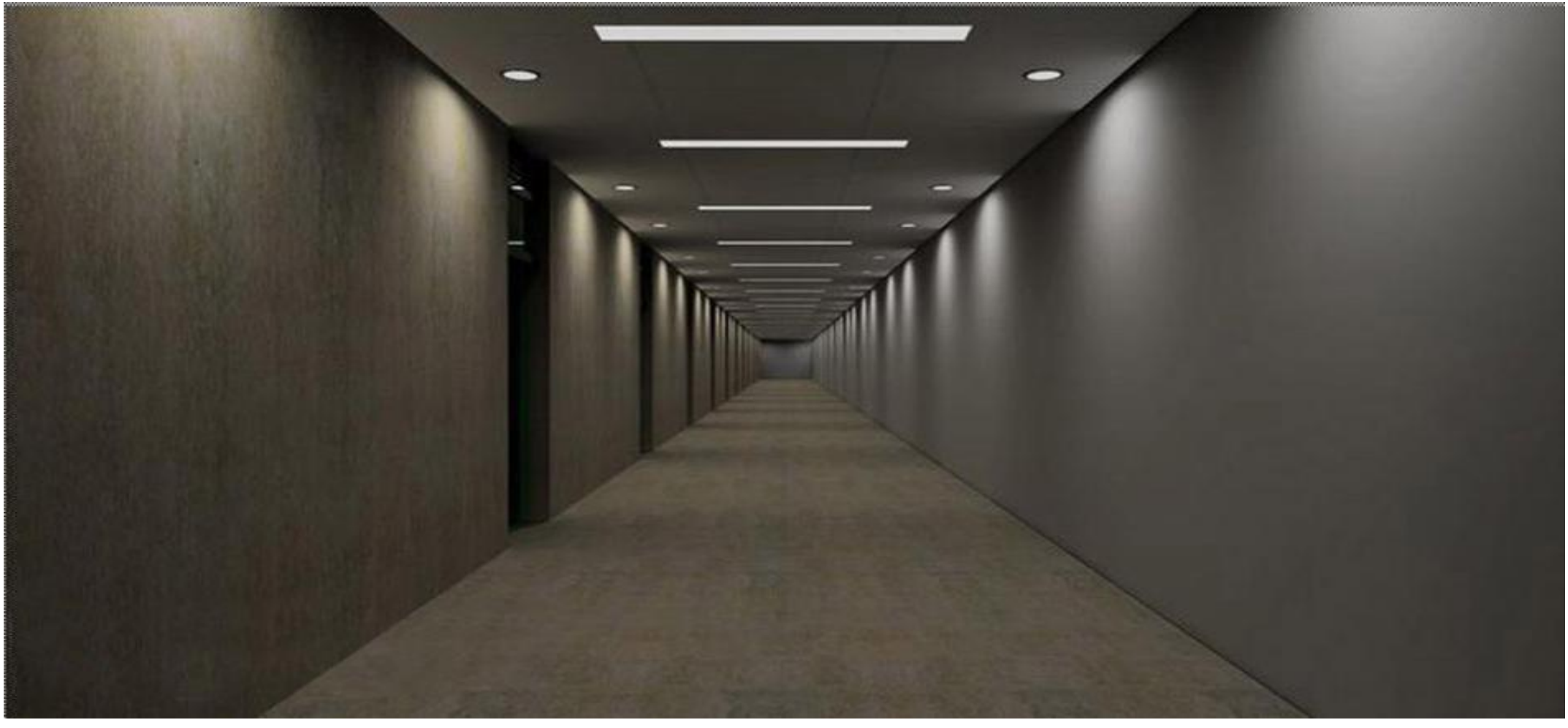
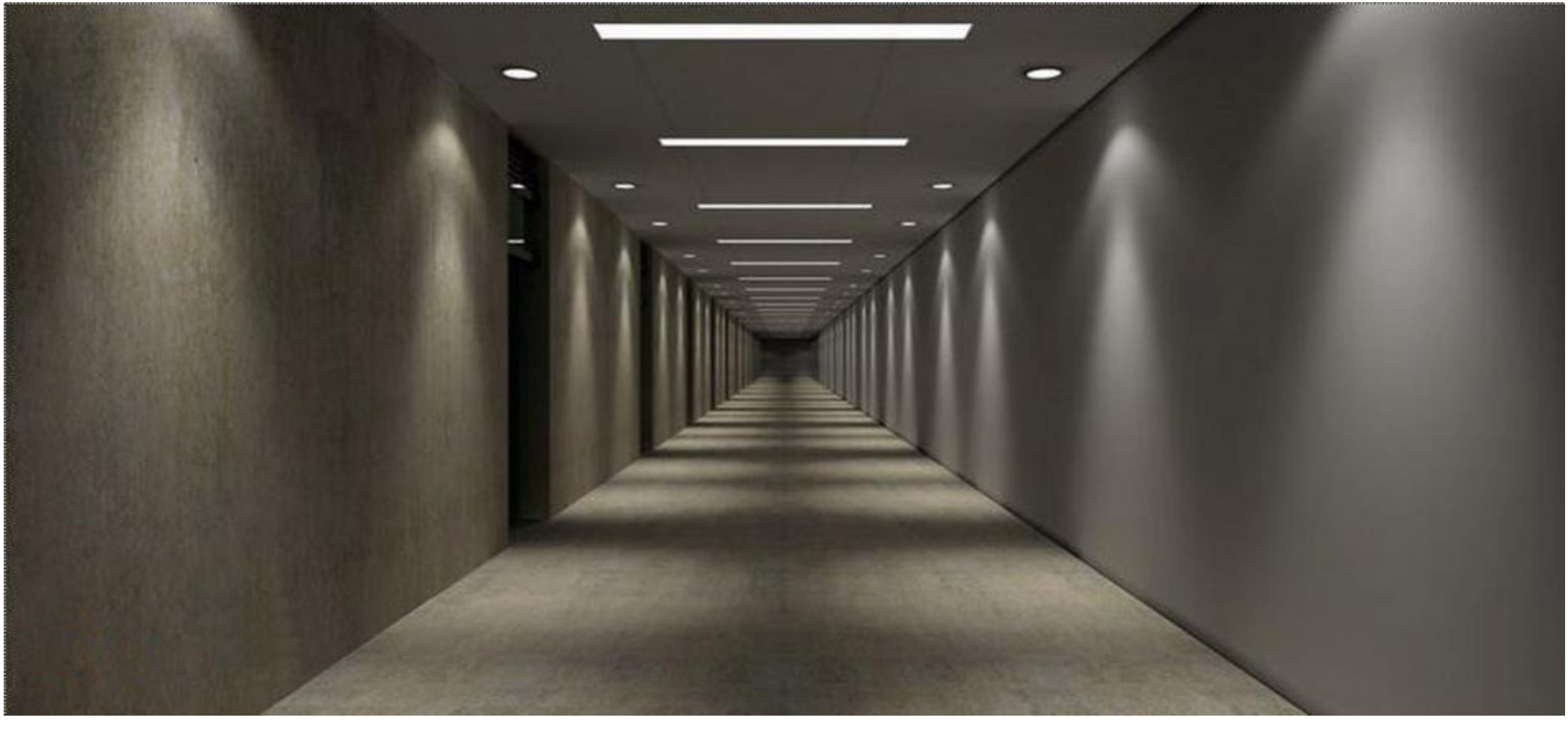
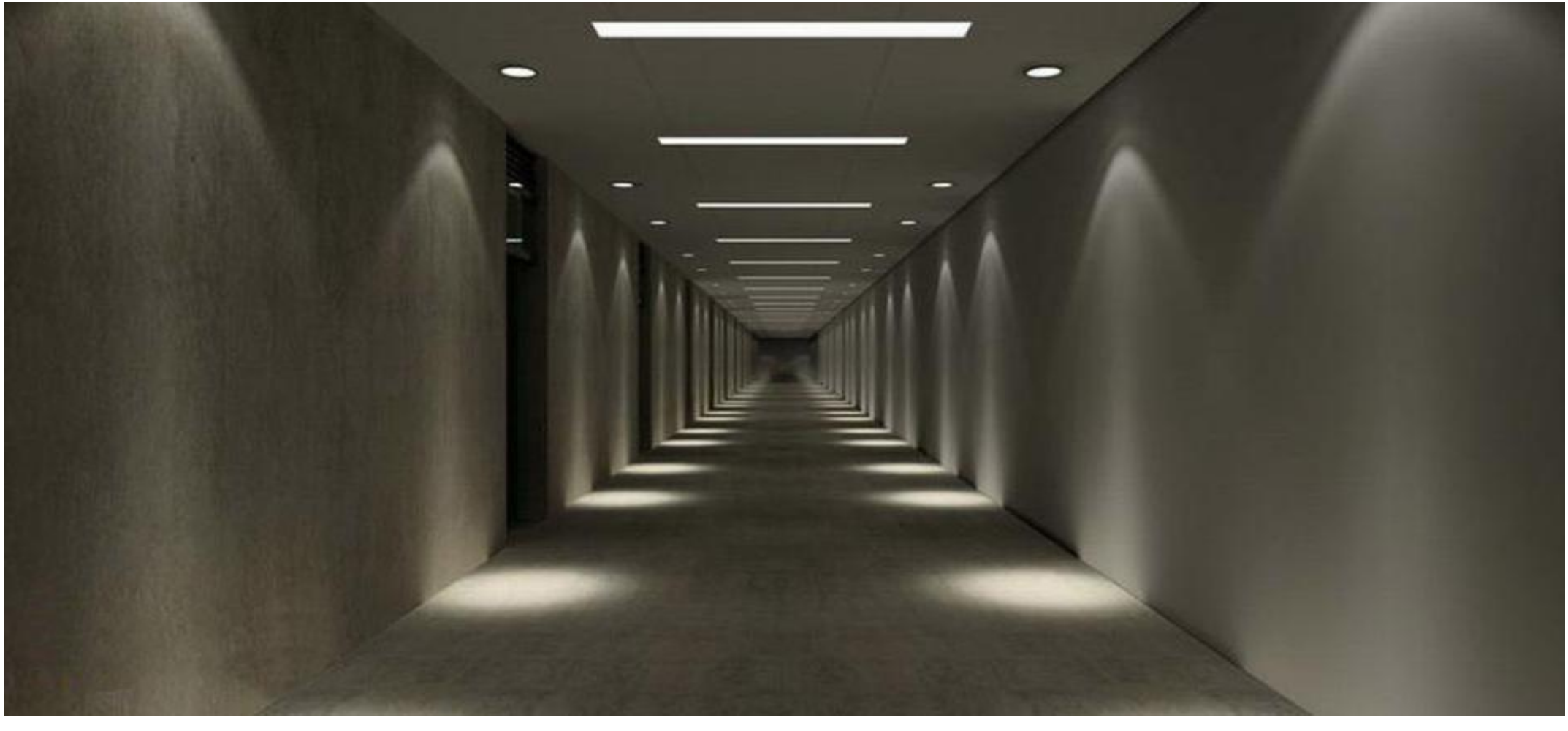
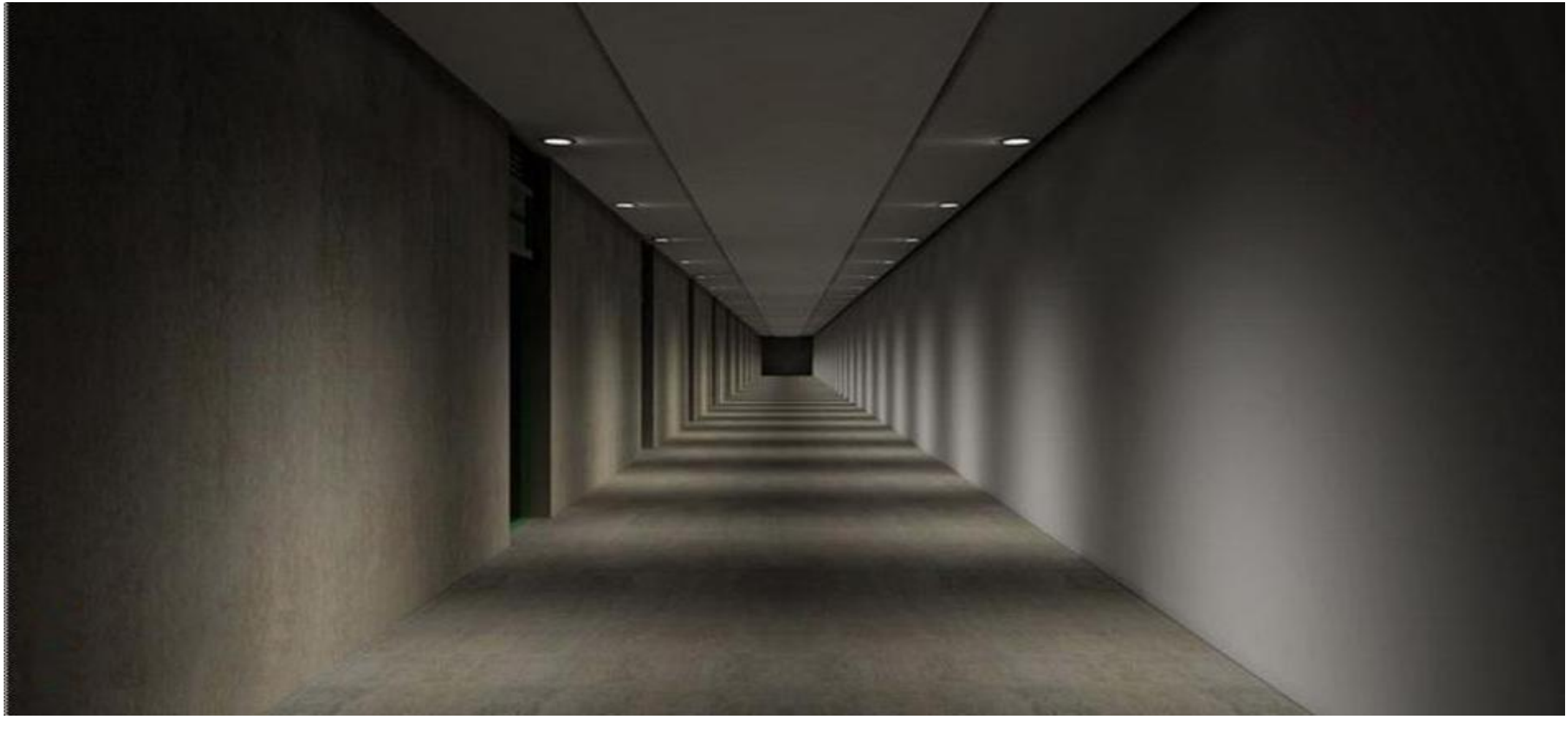
Spots
Flood

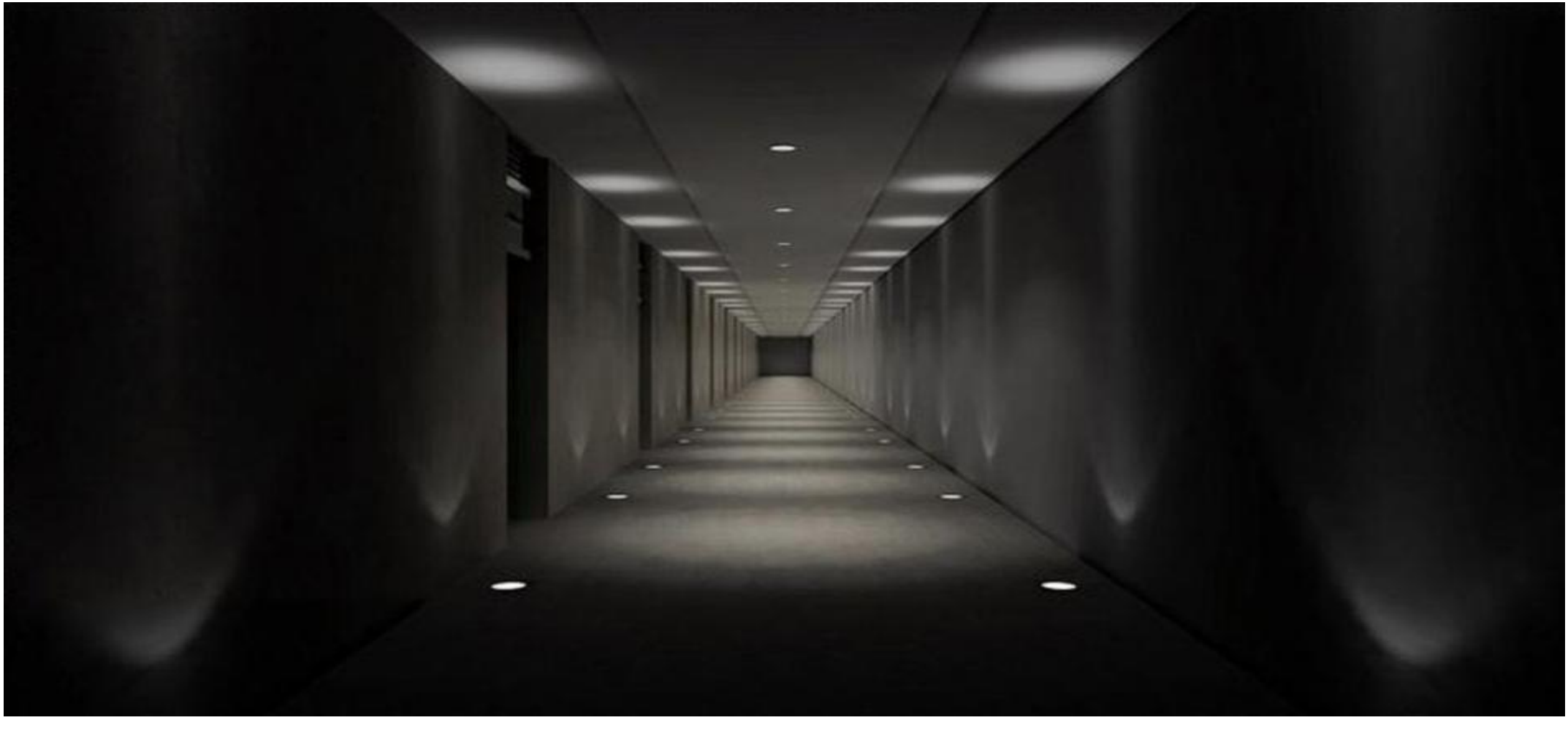


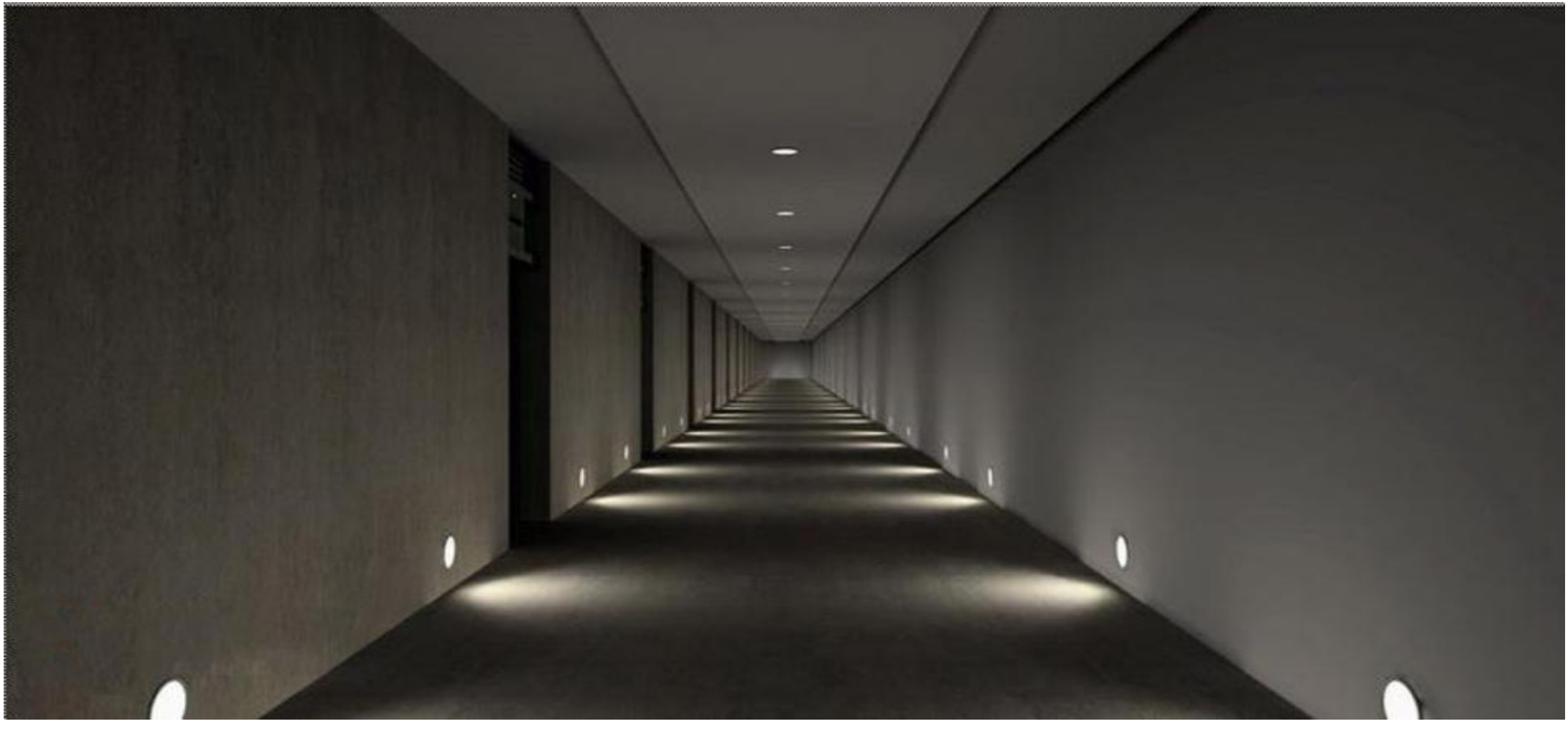












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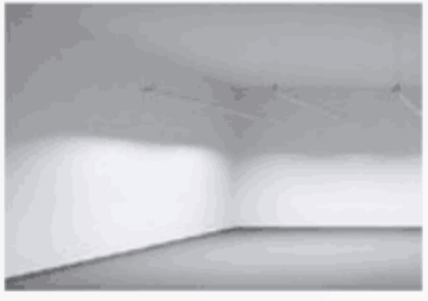
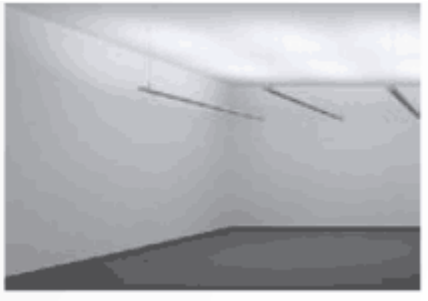
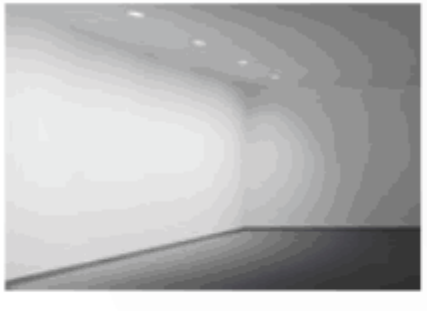
direct, aimed



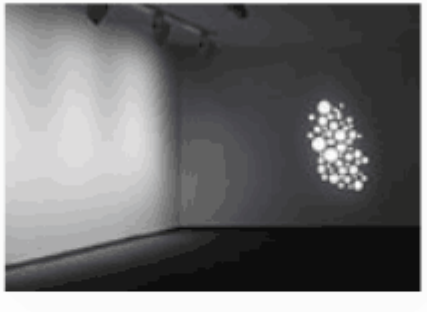
direct, diffuse



indirect



Wallwashing



Projection

Orientation lighting

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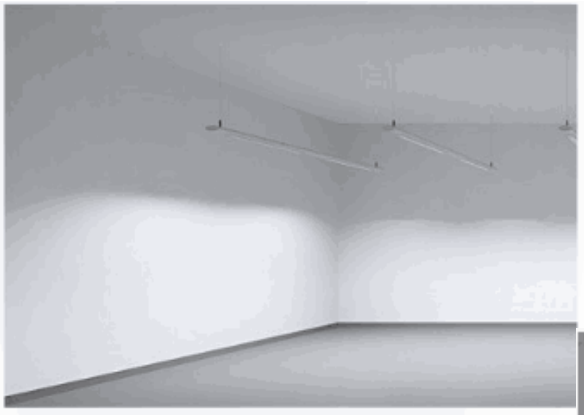
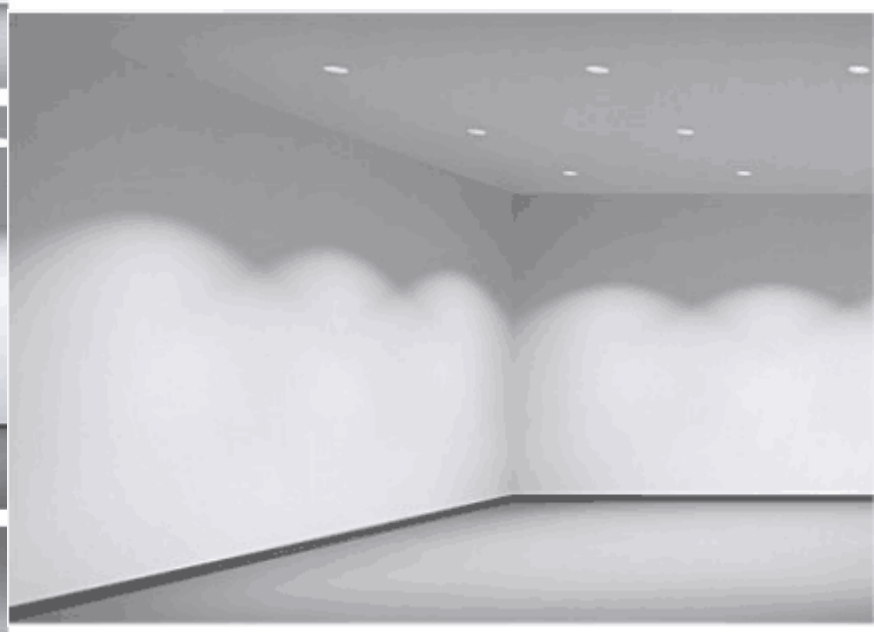
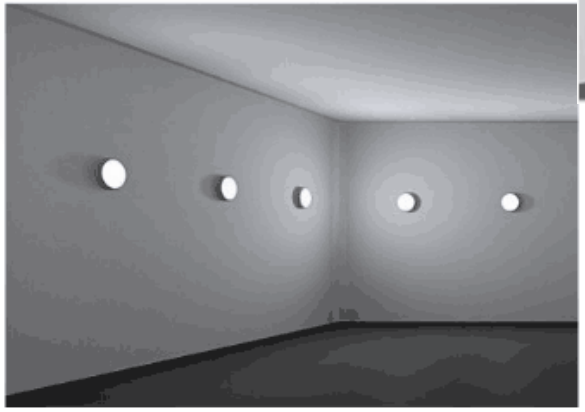
Observation



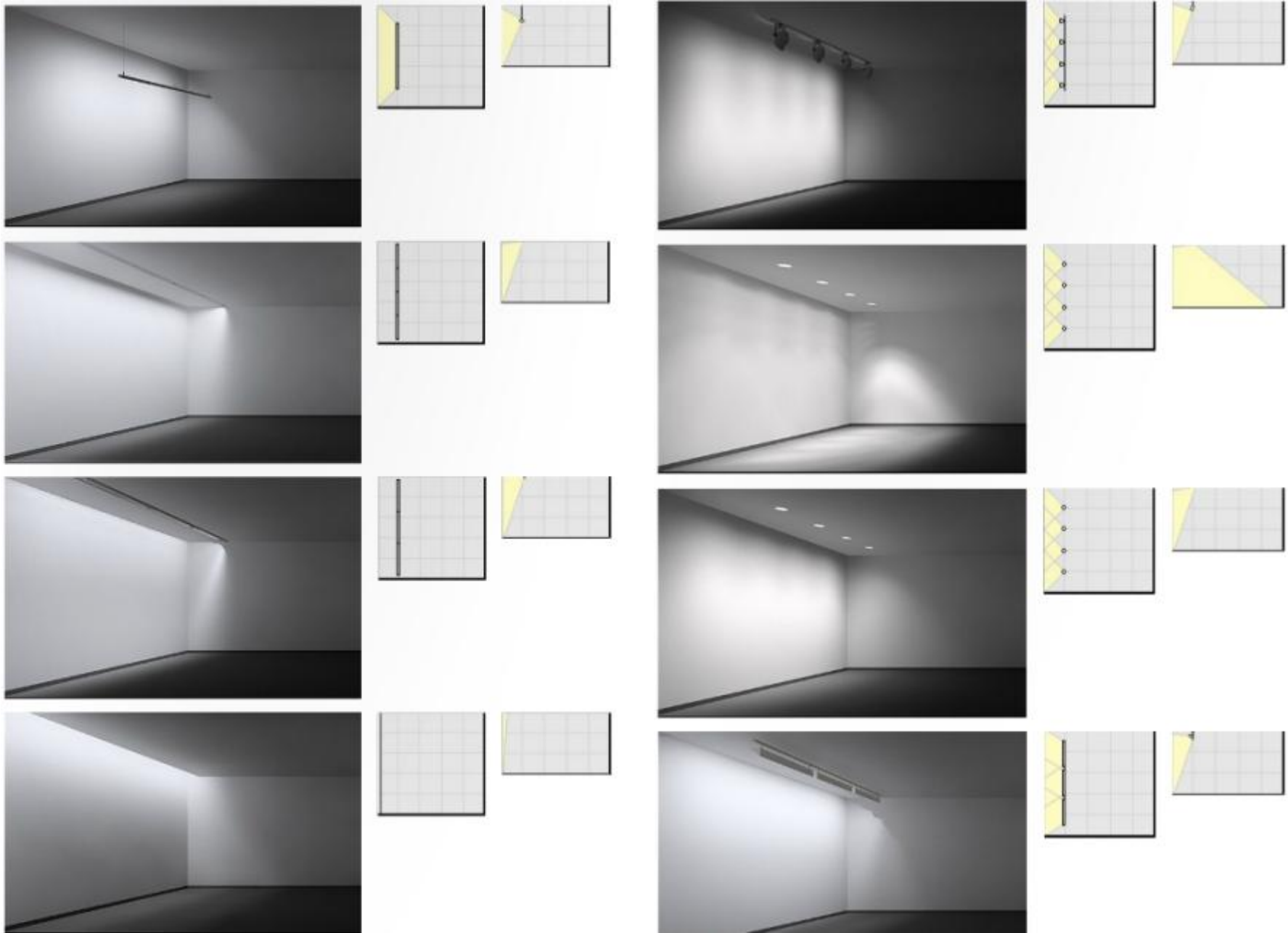
Light structures

Downlights, diffuse





Wall-mounted downlights, diffuse



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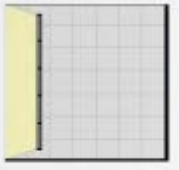
Washlighting illumination for vertical surfaces of:
- museums
- exhibitions
- trade-fair stands
- sales and representational areas

Preferred luminaire groups
- wallwashers
- washlights
- lens wallwashers
- double washlights
- perimeter luminaires



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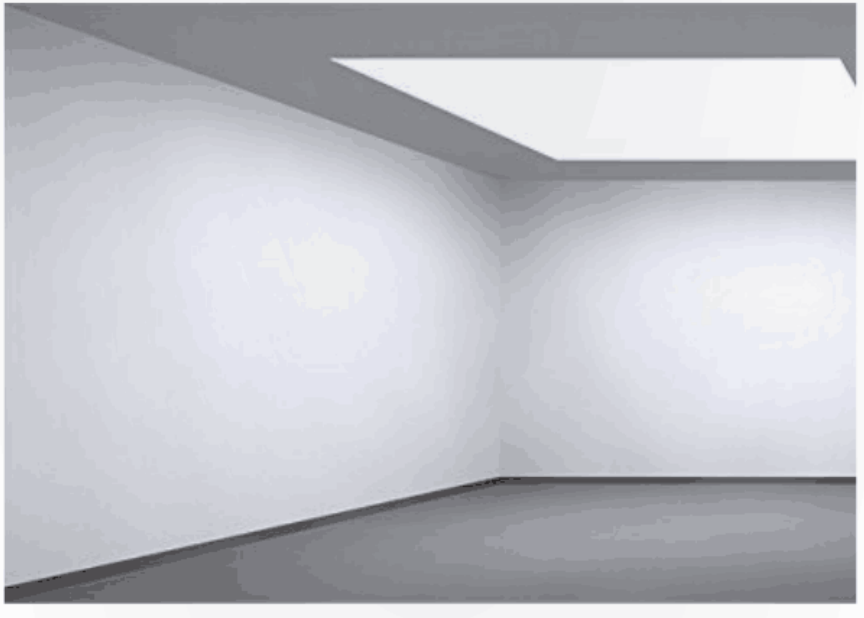
Direct, diffuse general lighting for
- working areas
- multifunctional rooms
- museums
- exhibitions
- pedestrian traffic areas

Preferred luminaire groups:
- light structures
- downlights
- wall-mounted downlights
- luminous ceilings



Direct diffuse light produces a soft illumination with little shadow and reflection. The limited formation of shadow results in weak modelling capabilities. Shapes and surface textures are only slightly emphasised.

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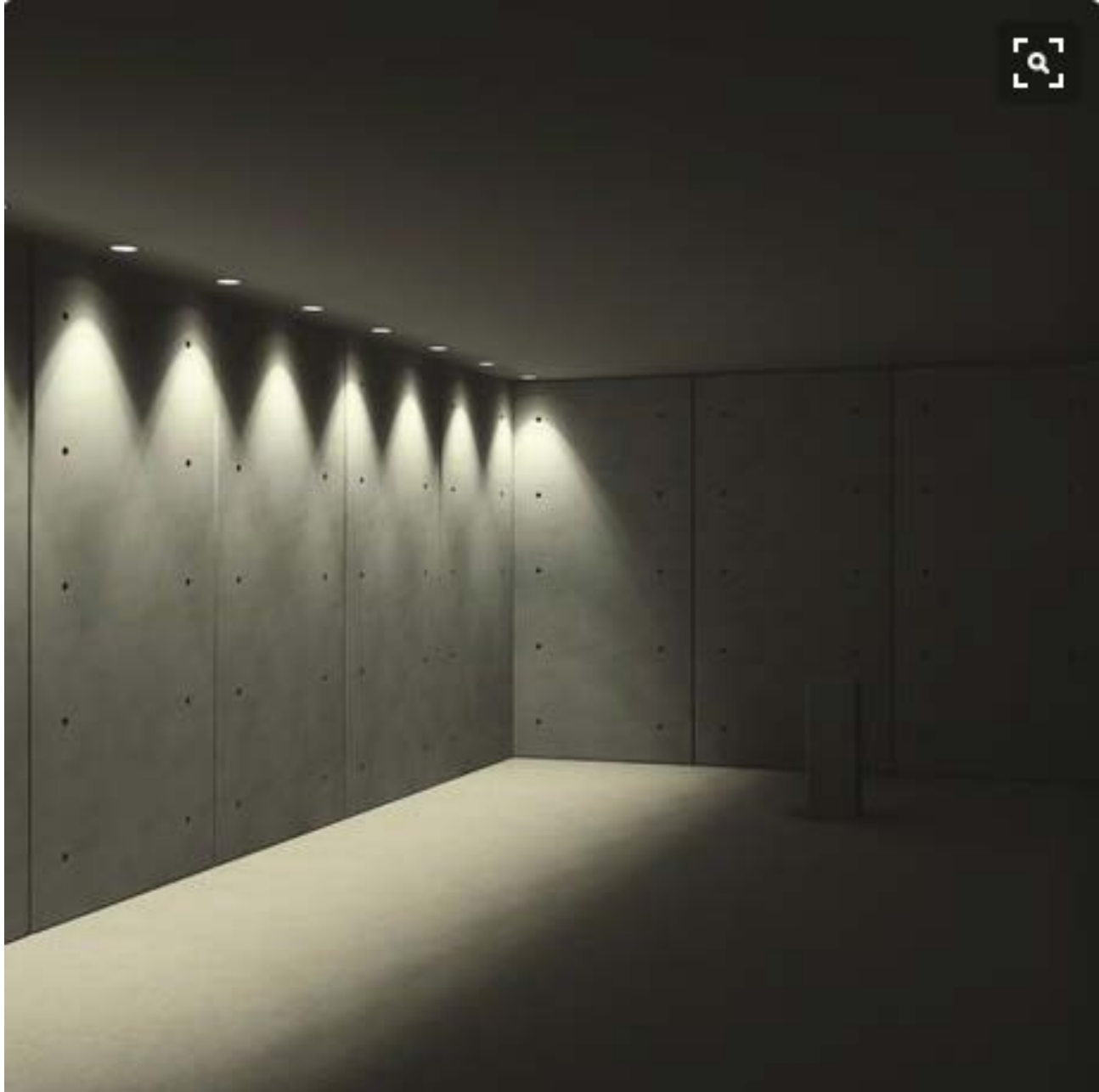

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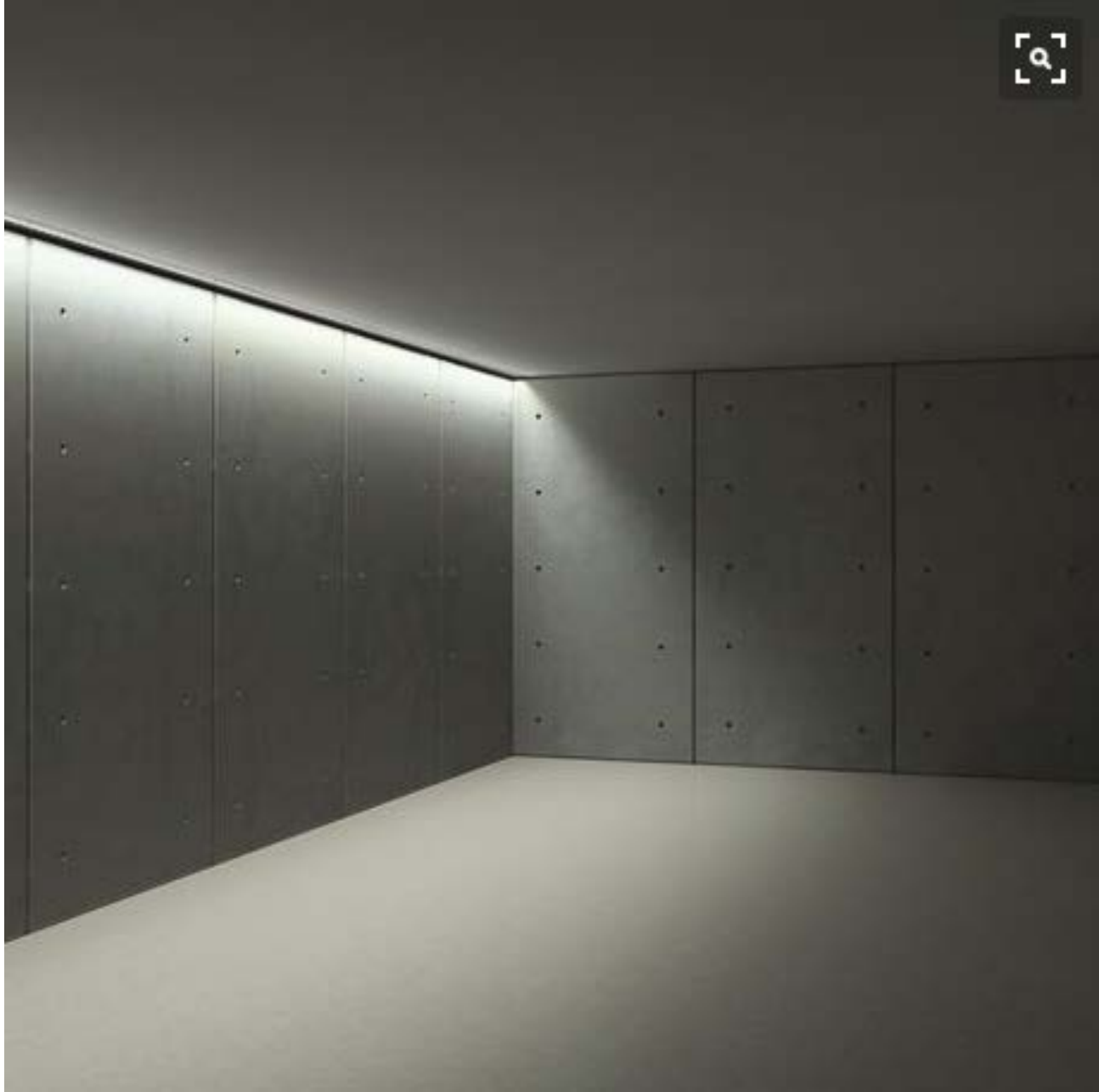

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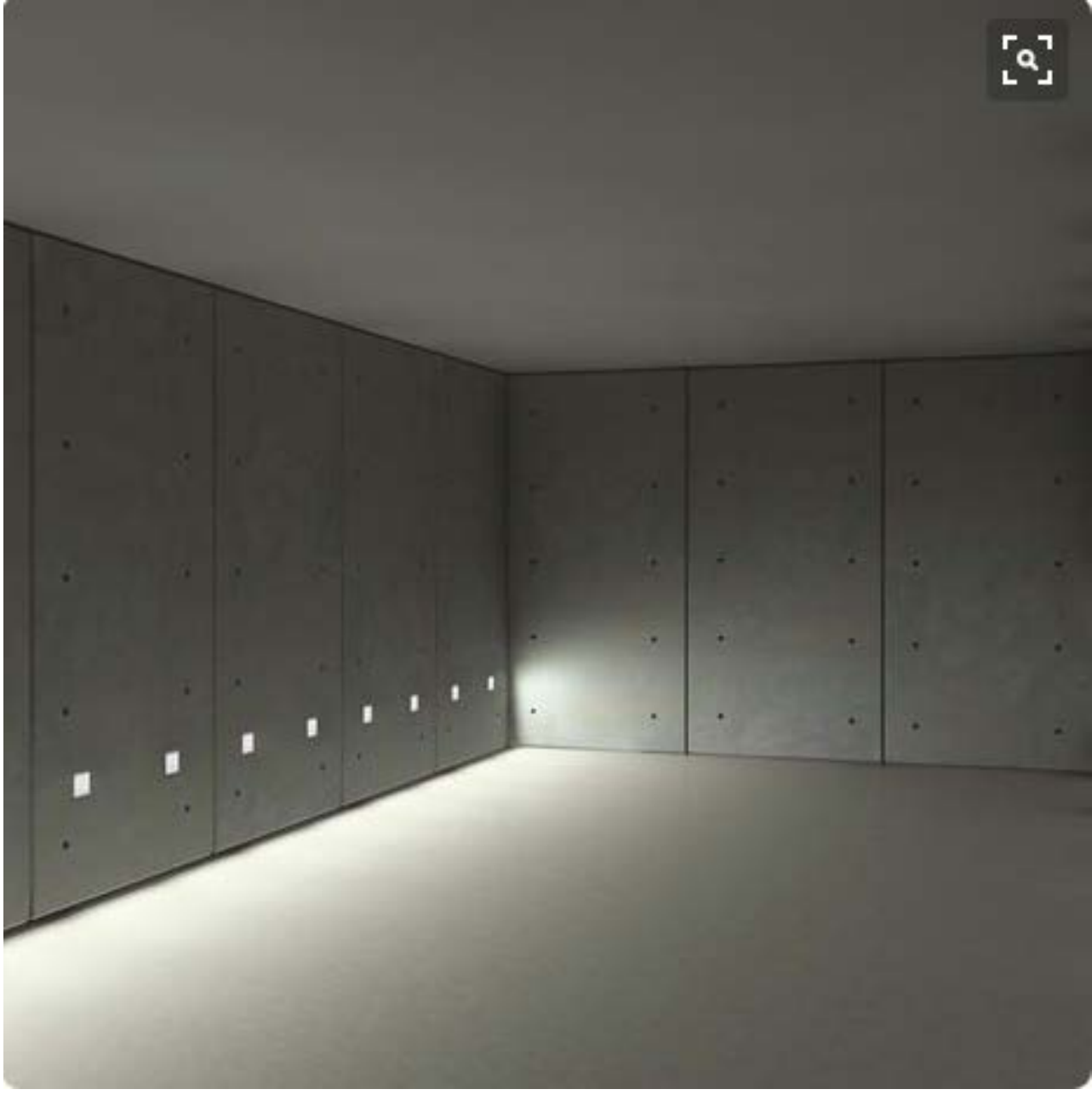

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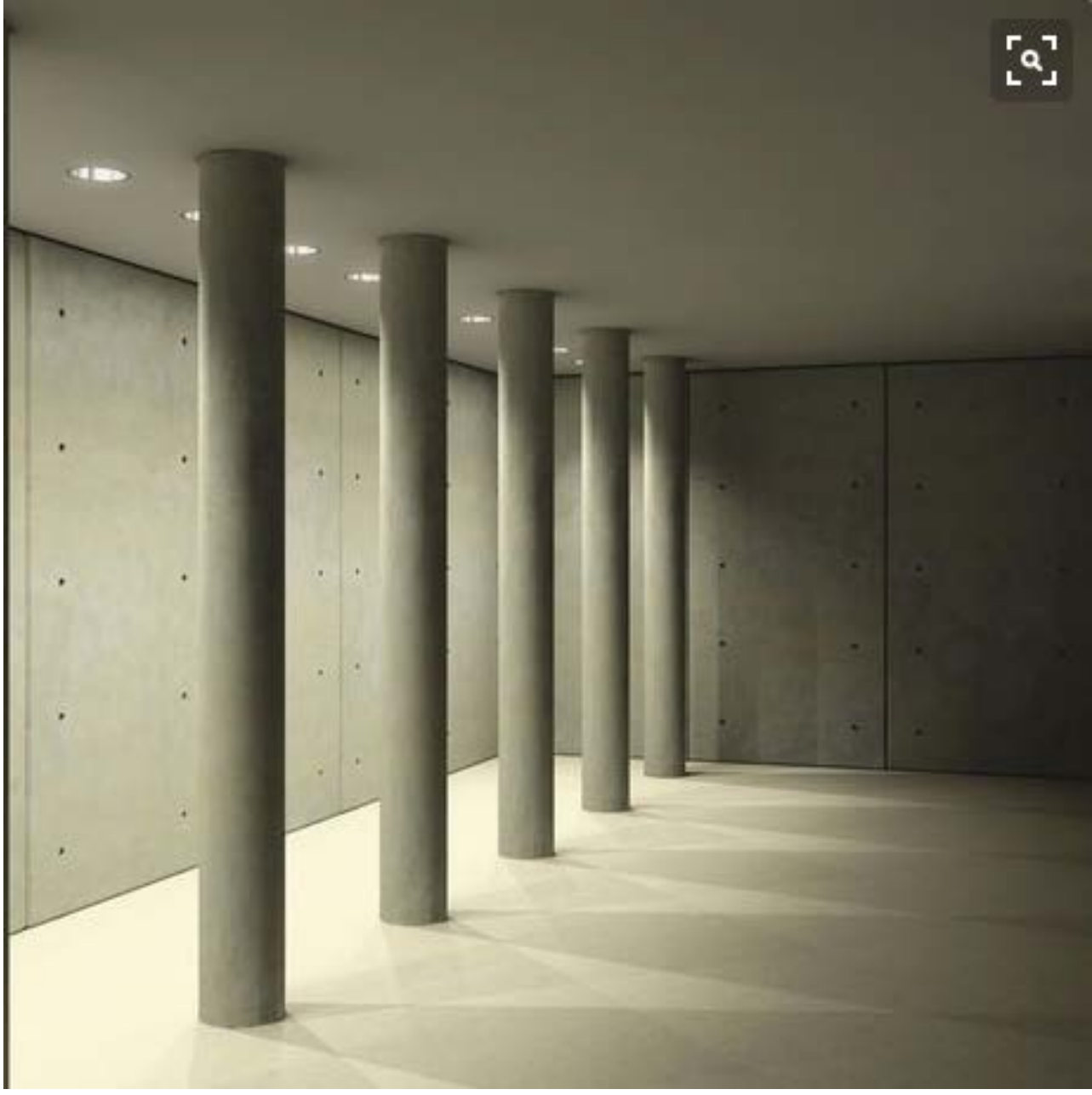

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# “光环境（照明）不仅仅是照亮”

氛围的营造，个性的凸显，内心的世界

谢谢