

Light In Architecture

Light in Architecture

Patterns of light and dark affect both our perceptions of the world and our emotional and physiological responses, and thus they are essential in gathering information about the physical world.

Good-quality lighting can support visual performance and interpersonal communication and improve our feelings of well-being.

Poor-quality lighting can be uncomfortable and confusing and can inhibit visual performance.

The overall purpose of lighting is to serve the needs of people.

The role of the lighting designer is to match and rank the needs of the people using the space with the economic and environmental considerations and the architectural objectives, and then to translate the results into a workable design and functional installation.



Designing with Light

- Light plays a central role in the design of a visual environment.
- The architecture, people and objects are all made visible by the lighting.
- Light influences our well-being, the aesthetic effect and the mood of a room or area.
- It is light that first enables "what you see".

Our perception of architecture will be influenced by light:

- Light defines zones and boundaries,
- Light expands and accentuates rooms,
- Light creates links and delineates one area from another,
- Light create impressions of a space

Planning and Process



- The basis for every lighting concept is an analysis of the project...
 - the tasks the lighting is expected to fulfill,
 - the conditions and special features of a space or work surface.
- A **quantitative** design concept can to a large extent follow the standards laid down for a specific task.
 - standards will dictate how much light is needed,
 - the degree of glare limitation,
 - the source color and color rendering.
- When it comes to **qualitative** planning, it is necessary to gain as much information as possible about the environment to be illuminated, how it is used, who will use it and the style of the architecture.

Summary

- An understanding quality versus quantity
- Art and Science
- Utilization of Space
- Psychological Requirements
- Architecture and Ambience

Light In Architecture

Planning and Process



Preliminary Phase:

- Lighting concepts list the properties that lighting should possess. They may give no exact information about the choice of lamps or fixtures or their arrangement, but will define moods, atmosphere, energy, and/or quality goals.

Design Development Phase:

- Further analysis provides illumination guidelines giving information about the individual forms of lighting... i.e. direction, location, light levels will define performance requirements from fixtures and lamps, etc.



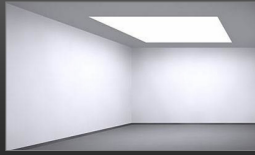
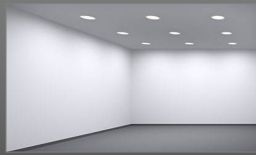
Construction Document Phase:

- Final documentation... locations, spacing, with fixture and lamp specifications

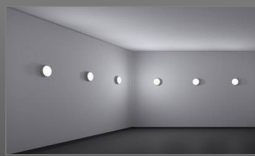
The challenge of a qualitative lighting design is to develop a design concept that combines the technical and aesthetic requirements of complex guidelines.

A concept that delivers the required performance with a equal level of technical expertise and the highest level of artistic clarity will produce the most convincing solution.

Types of Lighting

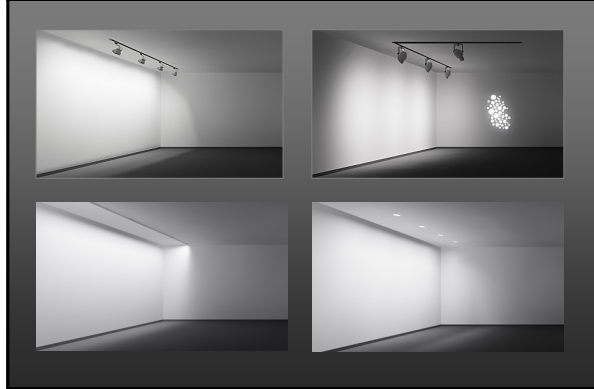


Types of Lighting

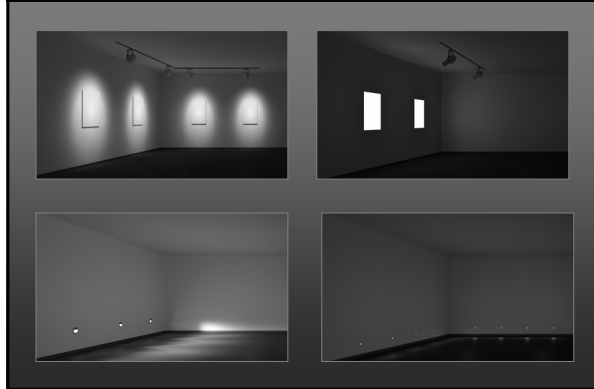


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Types of Lighting



Types of Lighting



Light Patterns in Architecture... *for clarity*

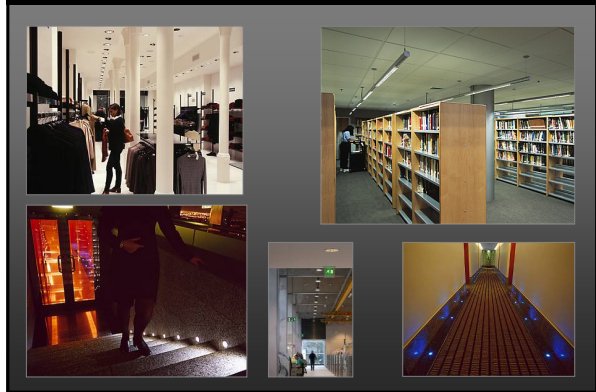


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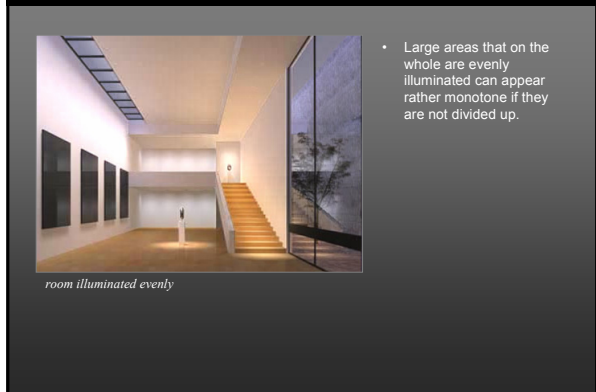
Light Patterns in Architecture... for form



Light Patterns in Architecture... for function

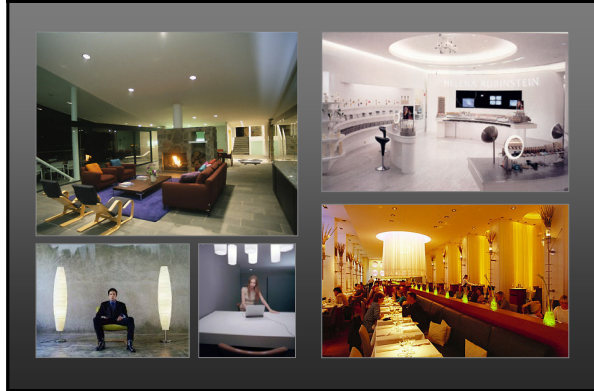


Forming Functional Zones



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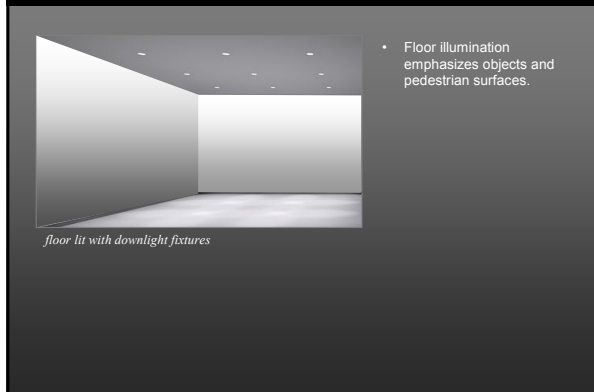
Forming Functional Zones



Forming Functional Zones - Exterior

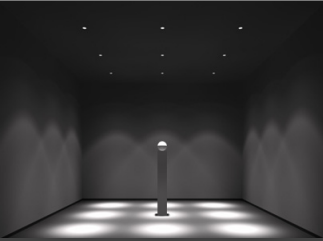


Defining Spatial Borders - Horizontal



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Defining Spatial Borders - *Horizontal*



floor lit with downlight fixtures - light walls

- Floor illumination emphasizes objects and pedestrian surfaces.

Defining Spatial Borders - *Horizontal*



floor lit with downlight fixtures - dark walls

- Floor illumination emphasizes objects and pedestrian surfaces.

Defining Spatial Borders - *Horizontal*

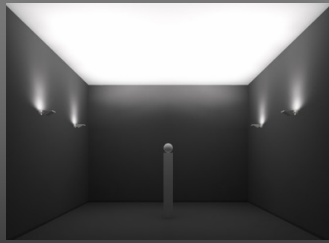


ceiling uniformly lit with uplight wall fixtures - light walls

- Indirect lighting of a ceiling creates diffuse light in the room with the lighting effect being influenced by the reflectance and color of its surface.

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Defining Spatial Borders - *Horizontal*



ceiling uniformly lit with uplight wall fixtures - dark walls

- Indirect lighting of a ceiling creates diffuse light in the room with the lighting effect being influenced by the reflectance and color of its surface.

Defining Spatial Borders - *Vertical*



walls uniformly lit with wall fixtures

- Vertical spatial borders are emphasized by illuminating wall surfaces.
- Uniform light distribution emphasizes the wall as a whole.
- Bright walls create a high level of diffuse light in the room.
- Vertical illumination is used to shape the visual environment.
- Room surfaces can be differentiated using different levels of illuminance to indicate their importance.
- Uniform illumination of the surfaces emphasizes them as an architectural feature.

Defining Spatial Borders - *Vertical*



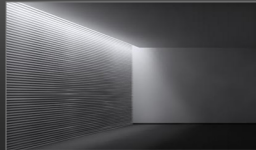
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Defining Spatial Borders - *Vertical*



- Grazing light gives the wall structure by adding patterns of light.
- A decreasing level of brightness across a wall is not as effective as uniform wall washing at defining room surfaces.
- Lighting effects using grazing light emphasize the surface textures and become the dominant feature.



Emphasizing Architectural Features



walls lit with grazing fixtures

- The illumination of architectural details draws attention away from the room as a whole towards individual components.
- Columns appear as silhouettes in front of an illuminated wall.

Emphasizing Architectural Features



columns lit with grazing fixtures

- Rooms can be given a visual structure by illuminating the architectural features.
- Narrow-beam downlights emphasizing the form of the columns.

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Emphasizing Architectural Features



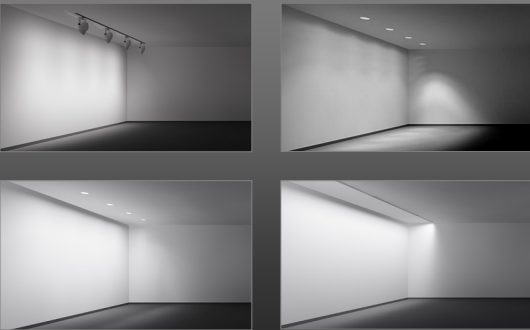
- Grazing light accentuates individual elements or areas and brings out their form and surface texture.
- Grazing light can cause highly three-dimensional features to cast strong shadows.
- By using different levels of illuminance, different parts of a room can be placed in a visual hierarchy.

Emphasizing Architectural Features



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Visual Clarity



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Visual Clarity



The lighting distribution on an unstructured wall becomes a dominant feature.

Light distribution that is not aligned with the architectural structure of the space is perceived as disturbing patterns that do not relate to the space.

Irregular or uneven luminances can result in confusing lighting situations. This is evident, for example, when light patterns created on the walls bear no relation to the architecture.

The observer's attention is drawn to a pattern that cannot be explained through the properties of the wall, nor as an important feature of the lighting.

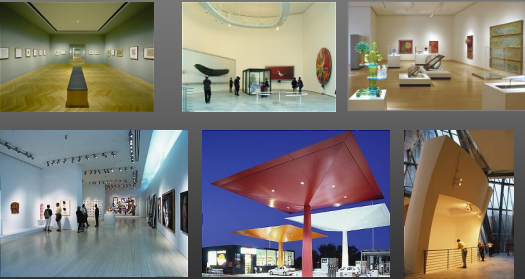


The perception of brightness of the grey field depends on the environment - in bright surroundings, an identical grey appears darker than in dark surroundings.



The continuous luminance gradient across the surface of the wall is interpreted as a property of the lighting. The wall reflectance factor is assumed to be constant. The grey of the sharply framed picture is interpreted as a material property although the luminance is identical to the luminance in the corner of the room.

Visual Clarity



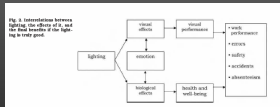
Psychology of Light

Because the sense of sight is contrast sensitive, the brightness contrast of a space determines its emotional impact

Emotional Impact: individual impressions of a space are a function of brightness contrast

—the relationship of surfaces that are lighted to those left in the dark

—the focus or foreground to the surround or background



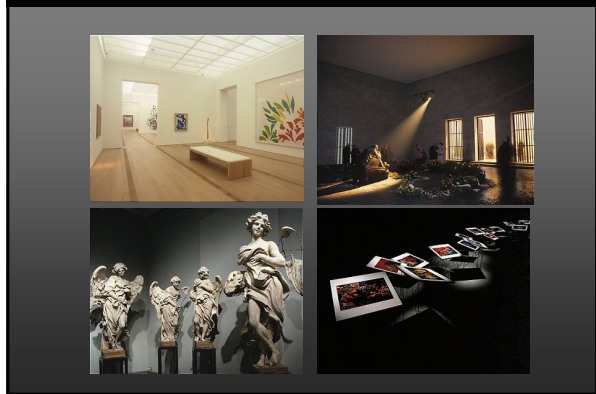
General illumination in a room will permit vision. The emotional impact of an interior through the manipulation of brightness contrast is a real challenge for the creative lighting designer.

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Emotional Impact



Emotional Impact



Degrees of Stimulation

- All activities benefit from some form of visual stimulation
- High levels encourage participation and increase enjoyment
 - Low levels help a person feel contented, comfortable, focused, and relaxed

Although individuals react differently to the same environment, there is a high degree of similarity in people's reactions to light.

Light In Architecture

Degrees of Stimulation

Environments that are complex, crowded, asymmetrical, novel, unfamiliar, surprising, random are **High-load**.
Environments that are simple, uncrowded, symmetrical, conventional, familiar, unsurprising, or organized are **Low-load**.



Degrees of Stimulation

Environmentalists use the terms **High-load** to **Low-load** to describe the degrees of stimulation of arousal.
The more stimuli that must be processed by a person, the higher the load.



Degrees of Brightness Contrast

The degree of brightness contrast evokes emotions in the same way as background music. It affects.....

- the performance of task,
- influences the behavior of people at work or play, and
- Impact the amount of containment and pleasure we experience.

The degree of brightness contrast establishes the emotional setting, which either enforces or undermines the intended activity.

Brightness contrast is established by developing patterns of light and shade – select which surfaces to receive light or leave other is darkness

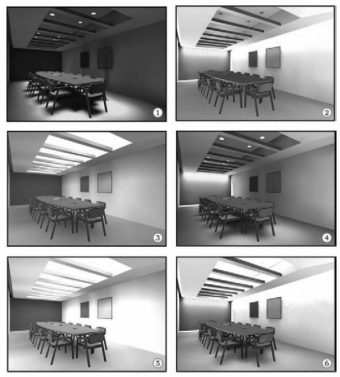
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Subjective Impressions

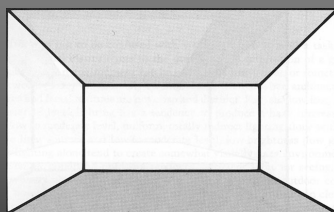
- Professor John Flynn's studies in the 1970's established fundamental research about how the distribution of light and resulting patterns of light effect our **subjective impressions** of a place.
- In particular patterns of light on vertical surfaces, because they are more noticeable, strongly influence our impressions of:
 - Spaciousness / Confinement
 - Visual Clarity / Haziness
 - Relaxation / Activation
 - Private/ Public

Subjective Impressions

1. **Direct lighting on table strong contrast, too harsh for lighting faces**
Pleasantness: Neutral
Clarity: Hazy, quiet impression
Spaciousness: Strong impression of confinement
2. **Lighting on all walls, low intensity, suitable for display**
Pleasantness: Neutral, tending towards a more pleasant impression
Clarity: Neutral
Spaciousness: Promotes impression of spaciousness, increased height
3. **Lighting of cove above, low intensity, pleasant for near and distant faces**
Pleasantness: Strong negative
Clarity: Strong promoting hazy, quiet impression
Spaciousness: Neutral
4. **Direct lighting on table, Lighting of small wall**
Pleasantness: Relatively Strong positive
Clarity: Neutral
Spaciousness: Neutral with strength in impression of length
5. **Direct lighting on table, Lighting of cove above soft subdued effect, pleasant for near faces**
Pleasantness: Relatively Strong negative
Clarity: Strong
Spaciousness: Somewhat
6. **Lighting of cove above, Lighting of walls flat shadow free**
Pleasantness: Strong
Clarity: Strong
Spaciousness: Strong



Subjective Impressions



SPACIOUSNESS

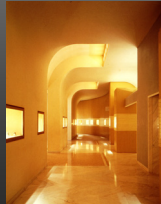
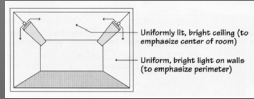
Reinforced by

- Uniform peripheral lighting, especially on walls
- Brightness is reinforcing, but not decisive

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Luminance Patterns

Spaciousness:
Relatively bright ceilings and walls are particular importance to reinforce a sense of spaciousness. Uniform illumination also helps make the room feel spacious.

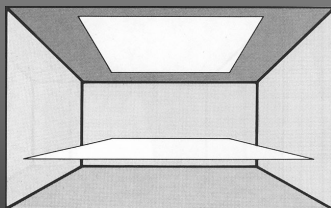


Subjective Impressions

Impression of Spaciousness – the room appears larger or smaller



Subjective Impressions



VISUAL CLARITY

Reinforced by

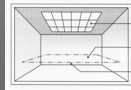
- Higher light levels on horizontal surfaces: workplane, ceiling plane
- Light in central area of room
- Some wall luminance
- Cooler, white light

Light In Architecture

Luminance Patterns

Visual Clarity:

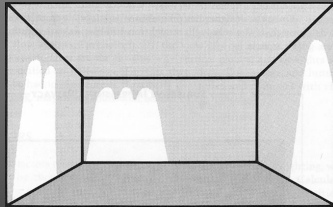
Visual clarity refers to the crispness and distinctness of the visual environment, rather than how well a task can be seen. Visual clarity is reinforced by shadows, by emphasis on horizontal surfaces such as the work plane and the ceiling, and by higher luminous in the center of the room.



Uniform, bright light from ceiling
(cool color temperature light sources)
High-brightness on horizontal plane
(to emphasize work surfaces)
Workplane (usually table top height)



Subjective Impressions



RELAXATION

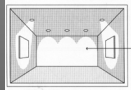
Reinforced by

- Non-uniform peripheral lighting, especially on walls
- Lower light levels
- Warmer-toned light sources

Luminance Patterns

Relaxation:

Relaxation also implies non-uniform lighting, with non-uniform wall lighting contributing to this impression. Warm color sources contribute to a relaxing feeling. Aspects of the patterns for relaxation can be effectively combined with those for visual clarity to create effective and comfortable work environments



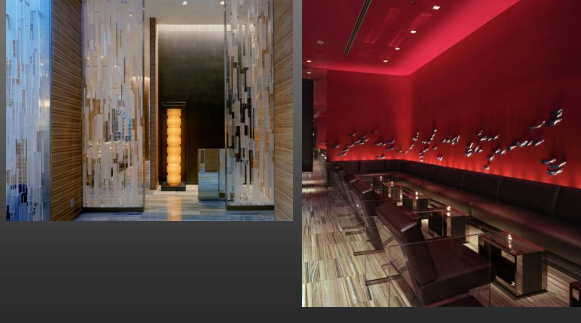
Non-uniform lighting on walls
(warm color temperature light sources)



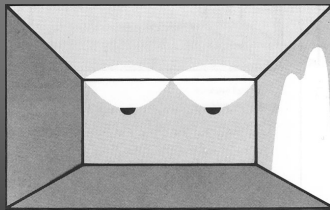
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Subjective Impressions

Impression of Pleasantness – *the room appears friendly of sociable*



Subjective Impressions



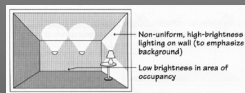
PRIVACY

Reinforced by

- Non-uniform
- Lower brightness in zone of user
- Higher brightness in zones surrounding user
- Wall lighting

Luminance Patterns

Privacy:
Privacy is light being in the shadows. Lighting patterns which are overall low, non-uniform, and darker zone of the occupant than in the surroundings will reinforce an impression of privacy. Vertical rather than horizontal surfaces should be lit.



Light In Architecture

Subjective Impressions

Impression of Perceptual Clarity – *the room appears public or private*