LIGHTING FOR INTERIOR DESIGN

INDS 313

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Lighting principles

Despite being the **most critical part** of the design process, the principles of lighting are often not well defined.

A **lighting design is most robust** when it is built on the foundation of a **strong conceptual approach**. Well-defined and coherent lighting principles also allow the **lighting design to evolve naturally** as the architecture, brief, and budget are revised throughout the design and construction process.

Visual hierarchy

During the day it is easy to think that the natural world has **one principal light source** in the shape of the sun.

However, our surroundings are always illuminated by a **combination of direct light from the sun and sky and light that comes from a multitude of directions and is reflected by clouds, plants, ground, snow, water, and rocks**. Each light source or source of reflected light has its own **qualities of intensity, direction, color, and diffusion**. Each source and reflection adds something, however small, to our visual environment. Even in the harshest glare of unfiltered equatorial sunlight, the naturally lit scene is defined not by a single source and single

The illumination of the Great Hall at Stirling Castle, Scotland, is built with layers of light to create the correct visual balance.

Visual hierarchy

direction of light, but by multiple directions, intensities, and color qualities of direct and reflected light. It is these combinations that give rise to **the richness of our visual experience**. To create interior environments with the same naturalistic feel we should embrace the notion of **using multiple layers of light** that combine to produce a complete scene.
Light can be a powerful medium to establish the kind of visual hierarchy that we seek in interior spaces. The simple choice of whether to **illuminate a surface or object directly affects the way it is perceived by the viewer**. We can choose to conceal **less attractive** areas by concentrating light where we want people to look; **we can make an area advance or retreat visually with the subtle use of color**; intensity and direction of light can also provide subtle signals about what is most visually important in the scene in front of us.

To be able to use the visual hierarchy of light successfully we need to get into the minds of the users of different kinds of space. An environment where people are agitated and need to find their bearings quickly, such as the entrance to a hospital emergency wing, requires **a very different visual hierarchy to an environment where people wish to linger and spend lots of time**, **such as a museum or gallery**. In either case, it is imagining or visualizing the scene from both the users' **point of view and their mindset** that makes it possible to create the most appropriate
lighting solution.

Visual hierarchy

Much of the lighting in the Great Hall is mounted at the wall head with 70 W metal halide uplight to reveal the hammer-beam oak roof

(A). **To prevent glare for visitors looking up from ground level, the ambient light is bounced off the limewashed white walls using 70 W metal halide spotlights**

(B), **with 150 W metal halide floodlights providing a wash down to around head height on the wall hangings**

(C). **Narrow-beam tungsten halogen spotlights pick out the heraldic crest**

(D) **And recessed fiber-optic downlights illuminate the fireplace recesses**

(E). **At night, low-voltage tungsten halogen spotlights uplight the reveals of the bay windows to replace the daylight**

(F). **All these elements are controlled independently so each layer can be turned off as required. In addition, moving mirror-effect projectors provide direct light to the floor area for special evening functions, such as concerts or dinners**

(G**). A ground-level control panel allows these projectors to be rotated to focus on the stage area or main floor. If required, the projectors can be programmed to provide colored light. Lighting by Speirs and Major Associates.**

Understanding qualities of natural light

If we want a space to have a legible and familiar feel we can work with the qualities of natural light. **By endeavoring to replicate or reinforce the direction, color, intensity, and variation of natural light we can fashion an environment that has the familiar quality of the exterior world**. Equally, it is easy to produce surprising and discordant environments by working against the patterns of light and color that we may expect to see in the outside world.

This can be used to attract people's attention, or to subtly discourage them from entering a space by lighting it in an uninviting manner.

reminiscent of an overcast day before a heavy rainstorm?

Does the good lighting example have clear parallels with the kind of natural light we enjoy; are important features strongly illuminated as if they were caught in a shaft of sunlight?

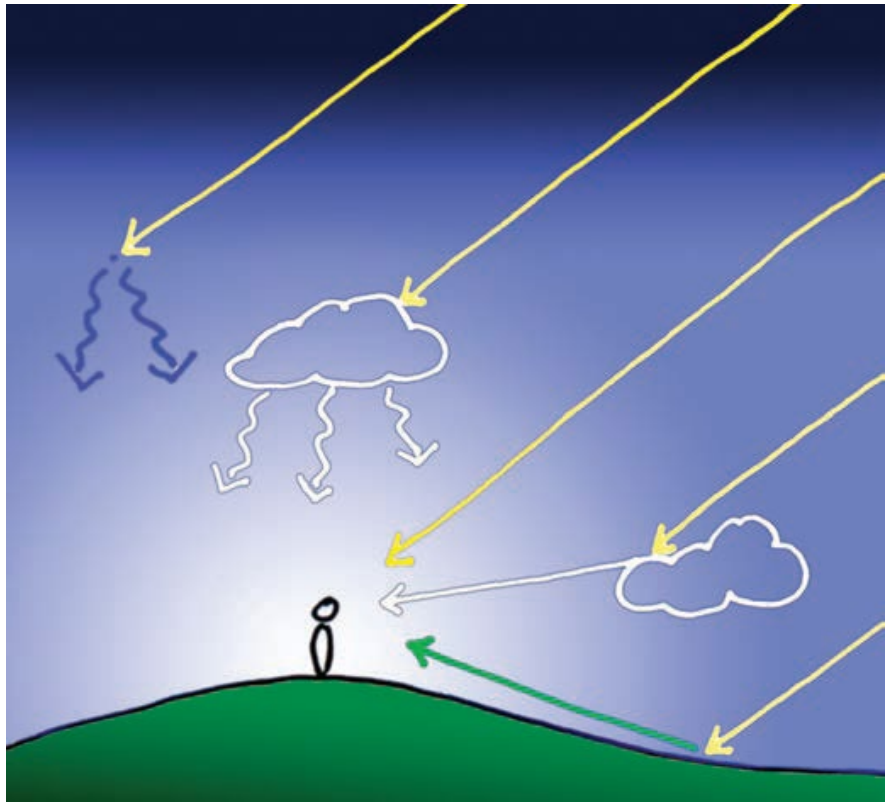
Whether or not we choose to work with them, as designers we should be aware of the qualities that define natural light.

A low-light space such as this museum tends to feel gloomy. This can be counteracted by introducing some sense of natural light. In this example the lighting designers created an artificial sky vault over the display cases, using blue cold cathode luminaires concealed in a trough. This inverted the usual experience of a dark soffit in this kind of low-light gallery, making the space seem much brighter than it actually is.

Understanding layers of light

A landscape seen on a bright sunny day may look as though it is illuminated solely by the sun. However, **the sky is a major contributor of additional light**. When it is clear blue it can supply a large amount of indirect sunlight at ground level. **Consider the sky as a dome** that sails high overhead and stretches down to the horizon in every direction. The direct light we receive from this sky dome comes from all directions above the horizon line. For this reason it is not directional and therefore does not create strong shadows—it produces a diffuse quality of light.

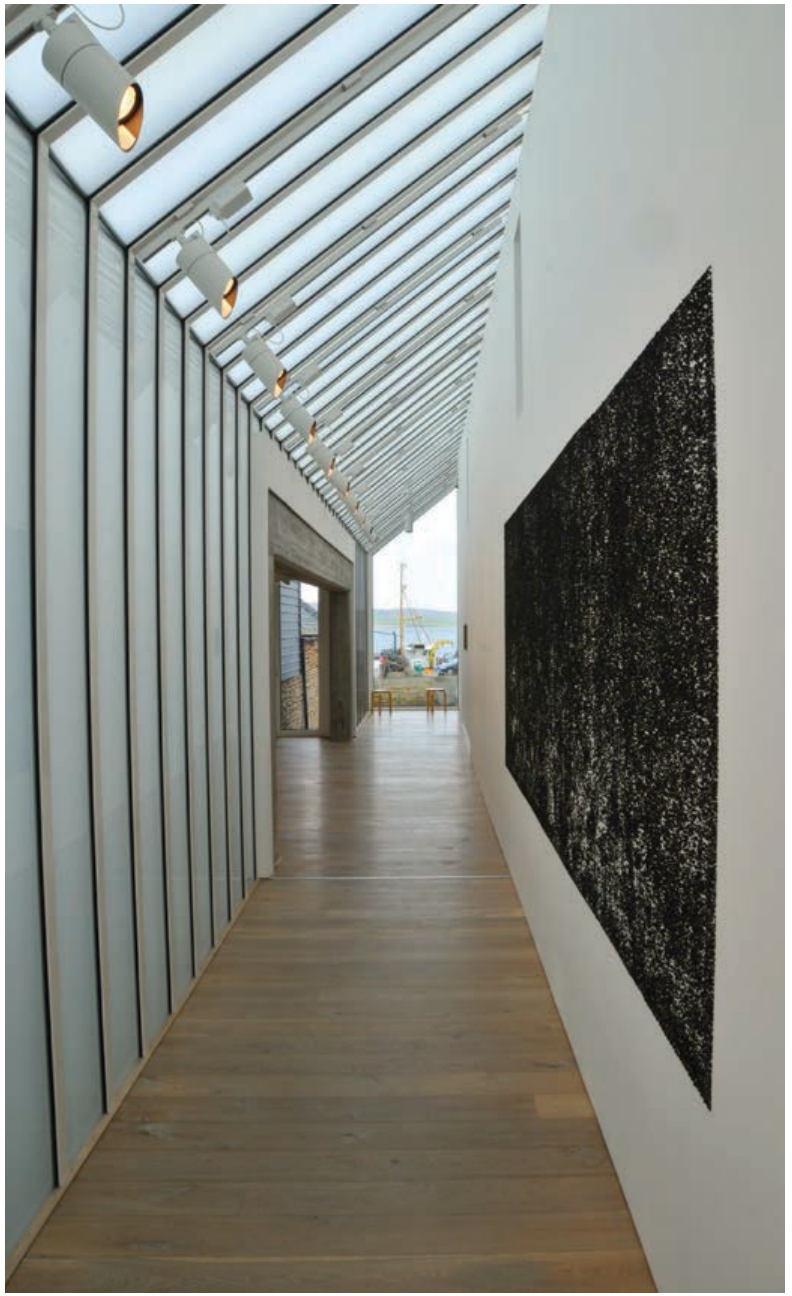
Sunlight reflects off clouds in the different levels of the atmosphere and off solid surfaces at ground level. Areas that are shaded from direct sunlight or sky light can still receive natural light that has been reflected from the ground, foliage, water, snow, and buildings. **The reflected light often picks up the color of the reflecting surface, and smooth shiny surfaces can focus it to create patches of higher intensity, such as the moving pattern of undulating light reflected from rippling water.**



Direct sunlight is only one component of natural light. Small particles in the upper atmosphere cause **Rayleigh scattering** of sunlight. The blue part of the spectrum is scattered most strongly, hence the blue of the sky. Direct sunlight is reflected by **clouds**, with much of it being reflected away from the surface of the earth. Clouds also transmit sunlight, which is diffused and softened by its passage through the water and ice they contain. On heavily overcast days this diffusion can produce an almost directionless quality to light at ground level, with almost no discernible shadows. Some sunlight is reflected by **surfaces at ground level**. Sunlight is the most directional of all the components of natural light and produces **the strongest and best-defined shadows**.

Understanding layers of light

Light in the natural world is all about the layering of light from multiple directions: **strong directional light mingling with softer diffuse light, white light with subtle tints picked up from the sky and reflecting surfaces**. This mixture changes constantly, providing a new pattern of light and shade every time we look. By comparison, **most artificially lit working environments have uniform lighting**; the light tends to come from only one direction and any reflected light is accidental and dependent on the furniture and fixtures in the space below the lights. **Even though pattern, texture and shadow provide a massive amount of visual richness in the natural world**, they tend to be deliberately excluded from most artificially lit interiors. It is no wonder that, with the light and wonder of the natural world designed out of them, many workplaces feel so **uninspiring, cold, and clinical**.



Where controlled daylight is allowed into an interior space, replicating the direction it comes from **allows artificial lighting to gradually take over as the daylight fades**. In this example the lighting designers mounted wall-wash spotlights on a lighting track attached to the roof-light glazing bars. These **luminaires can be switched off when there is sufficient daylight to illuminate the space, and can be gradually faded in to supplement daylight on dull days or in the evening.**

Understanding layers of light

This internal staircase in the Louvre museum in Paris receives no direct natural light, **but the indirect uplight reflected from the vaulted soffit replicates the typical conditions of a daylit sky.**

Change and variation

In Part 1 we discussed the changing nature of light over 24-hour and yearly cycles. Add to this the ever-changing moods and beauty created by weather systems and we have something remarkable. **Even if we never move from our vantage point and never alter our direction of view, the light around us is still constantly changing**. This continual and restless change defines light in the natural world. **A designer should never underestimate the richness of experience this adds to the visual world.** When designing the lighting for built environments we need to remember that change and variation in light are expected in a natural environment. **Small and deliberate changes in light color, color temperature, intensity, direction, and focus in different parts of the space are easy to implement and can transform an otherwise drab experience**. To achieve the **best possible design outcome** the designer should use **light and color to carefully plan the visual experience for the user, rather than simply using light to illuminate "task areas."**

A typical office space is designed to be **flexible** in its layout. This tends to result in lighting installations that aim for high degrees of uniformity. The typical installation has very little contrast or variation of direction, color, or changes in illumination levels over the course of a day. A desk placed in the center of the space receives the same quantity and quality of light whether it is day or night. This situation is not always completely in the control of the designer, **since many lighting standards and codes of practice for this kind of environment insist on high levels of uniformity.**

Creating drama through lighting

For something to be dramatic it must eschew the ordinary, the commonplace and the predictable. It should be **striking, unusual, and even completely unexpected**. By this definition, what we tend to experience on a daily basis is not dramatic. Sunlight does not care what it illuminates, but as designers we can be more discriminating. **We can make conscious decisions** about what should be visually important and what should recede into the background, and design the lighting accordingly. To make an object or surface stand out does not necessitate using very bright light sources—all that is needed is a good control of contrast. **Creating a hierarchy of visual importance and working with layers of light should ensure that the significant features of a space are not lost among uniformly illuminated surroundings.**
Dramatic lighting can come from the choice of lighting directions, color combinations, the pattern of light and shade, or the changing nature of any of these elements.

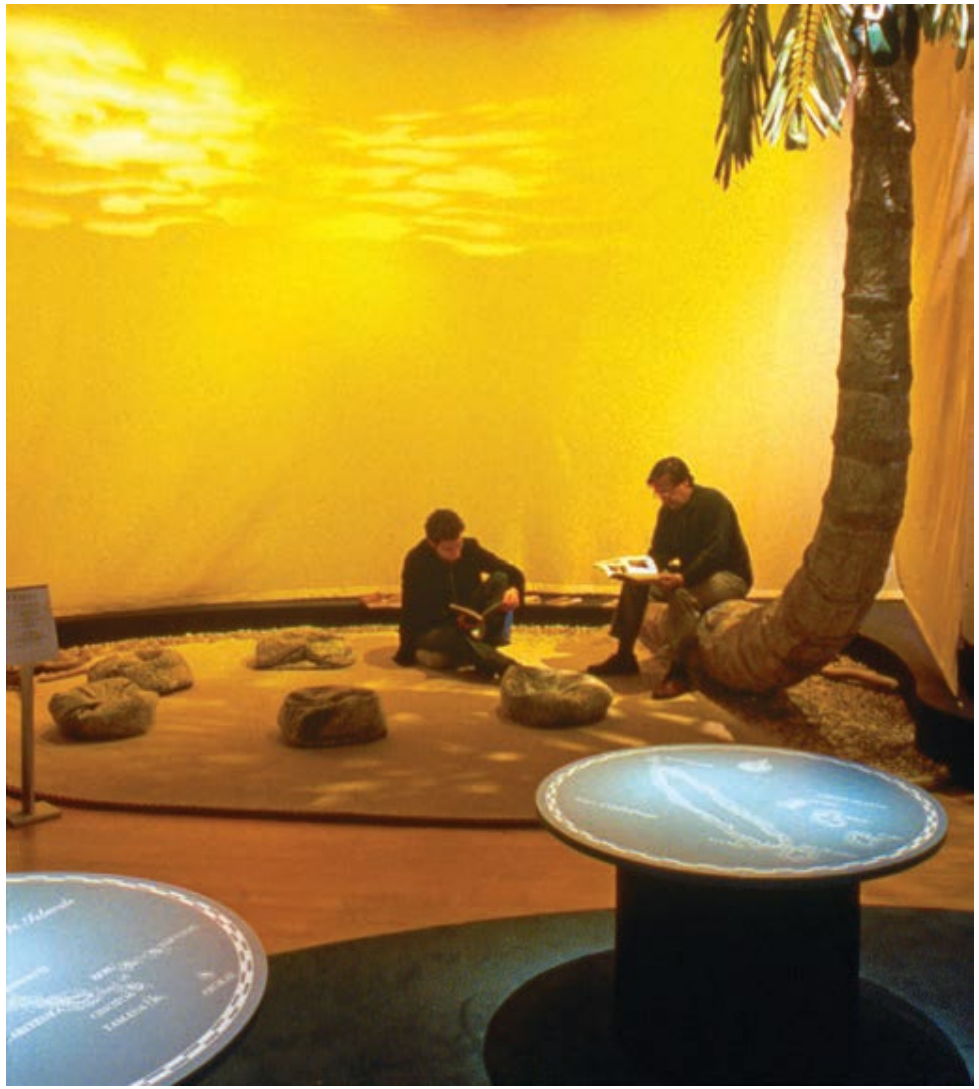
A shaft of sunlight entering through high-level clerestory glazing catches the sculpture and isolates it from its surroundings.

The unnatural direction of the strong uplight and the blood-red ambient light enhance the drama of this life-size figure in a tableau at a visitor center.

Creating drama through lighting

Despite the strong visual clues of overlapping layers of hills and the aerial perspective that fades and dulls the distant mountain, **a patch of intense sunlight can make part of the landscape seem to leap forward**. The clarity and intensity of light in the sunlit patch suggest it must be closer to the viewer than it really is. The fact that it is surrounded by relatively dark surfaces further elevates the visual importance of this part of the scene.

Creating drama through lighting



Theatrical lighting techniques are often employed in architectural situations to enhance the **sense of being somewhere** else. The lighting designer used colored light, projections of clouds, and light shining on a scenic palm to create the feeling of a desert island for a storytelling corner in an exhibition.

Changing and controlling light

Natural light is rarely static, so it is perhaps strange that much interior lighting only has two states: on or off. There are many reasons for lighting to change or be controlled. In the current climate, reducing electrical loads and therefore running costs is one of the most important.
If a space is adequately illuminated at certain times by daylight, it would be sensible to ensure that artificial lighting is switched off. Unfortunately, studies have shown that once lights are switched on in a typical working environment users rarely switch them off until they leave at the end of the day. A lighting control system with photocells that track light levels, either externally or inside a room, can automate the process of turning lights off when they are not required. Simple motion detectors can be integrated into luminaires or control systems to ensure lights are switched off when rooms are vacated.

In its normal temple surroundings this statue of the Hindu deity Shiva would typically be illuminated by the light of sputtering oil lamps. This would cast multiple shadows of the dancing figure, which would jump around as the light flickered. For this display the designer designed two custom luminaires that were recessed in the soffit in front of the statue. The luminaires contain a revolving textured glass disk that interrupts and distorts the light from two low-voltage lamps. The result is a gently flickering set of shadows that appear to be animated as if the statue were lit by oil lamps.

Changing and controlling light

During the day this narrow perimeter atrium gives a daylit feel to the internal office spaces through extensive roof glazing and vertical glazing on the external facade. At night the daylight is replaced by 400 W metal halide spotlights with daylight color temperature lamps. The luminaires are positioned to bounce light off the white, internal surface of the facade, to increase the luminance of the wall when seen from the internal office spaces.

Changing and controlling light

Bars and restaurants are often busiest at night and we tend to think of most of them as being dimly illuminated with a cozy atmosphere. The bar and restaurant shown on these pages is open during the day as well as at night. The designer has created contrasting atmospheres for day and night. The daytime lighting (above) is crisp and white, and blends well with daylight entering the space around the perimeter. At night (left), the lights dim to produce a warm, comforting glow, and some lights are switched off. Red LED uplights integrated into the window sills (right and far right) give an atmospheric red glow to the translucent curtains. This creates a strong brand image when seen from the street.

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Changing and controlling light

Changes in lighting can also be enacted by timers that select from a preset series of lighting effects. For a hotel lobby or restaurant these may include a number of different looks that are selected at different times of the day to suit the prevailing conditions for breakfast, midmorning, lunch, afternoon, evening meal, late evening, and overnight. The changes between these different states should take place over a period of at least several minutes, so as to appear seamless to customers.

While control systems allow sophisticated automated control of lighting, it is worth remembering that, especially in working environments, people need to feel that they can influence their surroundings. A lack of control is an often-cited feature of poor working environments, and something as simple as allowing employees to have their own desk lights can greatly improve their satisfaction. Of course, many of the desk lights will not be switched off at night, so it is still a good idea to have overall master control of all the lighting.

Change and control of lighting can also be employed to add dynamism to interior spaces. Where changes happen relatively quickly they are very noticeable and can be used to attract attention or add a level of activity and excitement. As a form of dramatic lighting, successful dynamic designs use change sparingly and form areas of relative calm to provide contrast with any movement or color change.

Changing and controlling light

Surfaces and texture

Light is about surface. Without a surface to capture and reflect the light, we will see nothing. Visualizing yourself in a space and “seeing” which surfaces are most important and prominent will help you to decide where the lighting should be positioned.

Surface itself is about texture. Materials can be smooth, rough, patterned, reflective, or matte. The combination of textural qualities should guide your choice of light source and locations to ensure that you can enhance or conceal the texture, or so that you can avoid glare from reflective surfaces but still create enough sparkle to prevent them becoming dull and lifeless.

Surfaces and texture

The footprints and ripples of sand in this image are nothing more than changes in light and shade. **The patterns have been revealed by low-angle sunlight; they could be lost under a shadowless overcast sky.**

Without the grazing light the three-dimensional quality of the carving could be lost on the casual viewer. **The angle at which light strikes a surface and the contrast with any ambient light determines the extent to which the texture or form is enhanced.**

Surfaces and texture

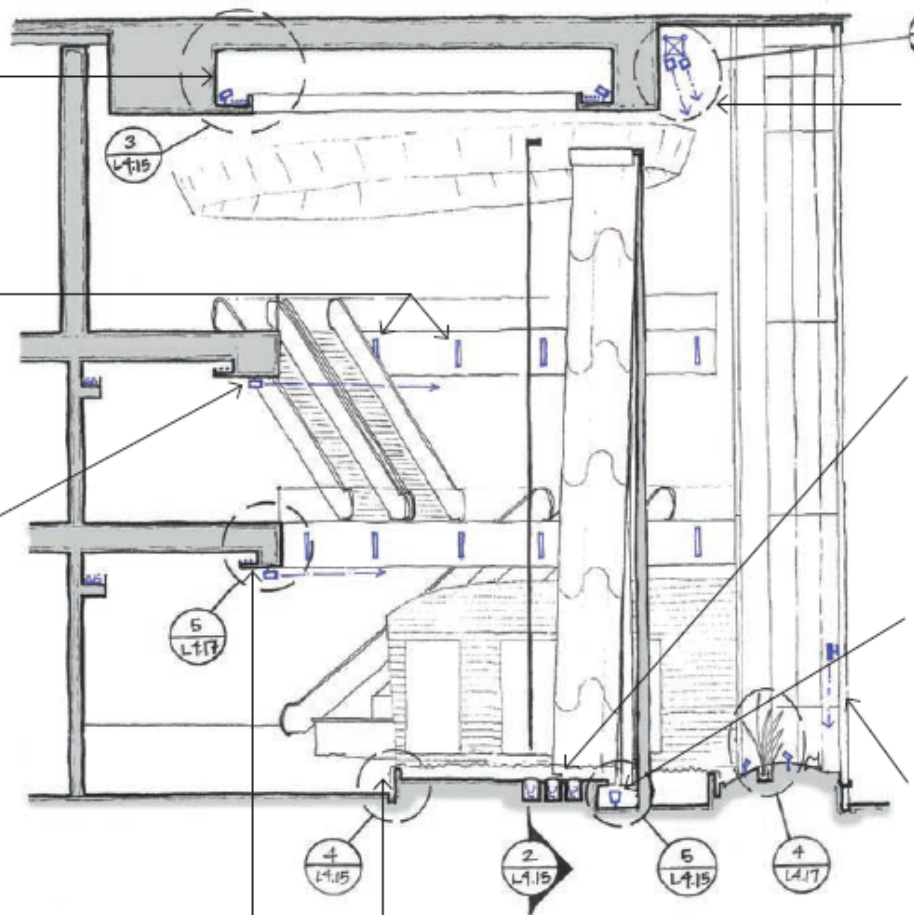
With ground-level low-voltage uplights deliberately mounted very close to the rough stone wall, **its texture is enhanced.**

Even where surfaces have no texture, pattern can be introduced with light. This traditional Arabic lantern is an interesting object when illuminated by the internal glow of a clear tungsten lamp. But the real magic is created when a thousand pinpricks of light are scattered over the surrounding walls. The pattern of light filtered through a perforated material is very evocative. Yet, without adjacent surfaces, it would remain invisible.

Surfaces and texture

It is clear from looking at the luminaire locations in the section drawing of part of the Pier Shops at Caesars, Atlantic City, NJ, that Focus Lighting has designed a project that is all about **surfaces**. Relatively little light is directed toward the ground, since this would not help the space feel well lit if there were no vertical illumination. The photograph shows how **textural surfaces are enhanced by the lighting**; some textural elements are entirely created by it. The water effect on the soffit panels is produced with theatrical projection equipment that creates a constantly moving effect of light reflected from moving water.

Surfaces and texture



Ceiling cove uplight position
Type "CA" colored fluorescents to uplight outer areas of ceiling cove and type "VA" colored metal halide floodlights to fill center of ceiling

Fascia sconce
Type "SA" sconce recessed in fascia at entry court

Retail coves
Two rows of type "CA" two-lamp colored fluorescents to uplight finished ceilings

Waterwall front projection
Video projectors mounted below bridge and promenade levels to generate moving video images on waterfall by others. See video consultant

Courtside coves
One row of type "CA" two-lamp fluorescents to uplight finished ceiling

Zero edge pool uplight
Type "FR" linear lighting to be mounted at base of pool edge to uplight pool side walls. Type "LFR" power supplies as needed mounted within accessible locations

Mural wall wash position
Type "VC" colored metal halide uplights clamped to retractable box truss. Truss to be mounted with lowering device, chain motors, winches to be lowered for servicing lighting equipment

Waterwall upper uplight
Type "WH" recessed submersible fixtures recessed in base of pools to wash higher portions of the waterfall. Contractors to co-ordinate slab recesses as required

Waterwall base uplight
Type "WA" submersible yoke-mounted fixtures mounted at base of waterfall

Indoor beach area
Type "KO," "KG-2" accents mounted within artificial dunes to uplight grass and fences. Type "GA" internally illuminated rocks mounted within dunes, electrical contractor to provide receptacles as required