



Architecture and Lighting

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Topic: Educational Lighting Site

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A detailed study aimed at illuminating an architectural element must be based on a few objective considerations such as:

- architectural properties of the monument
- characteristics of the construction materials that have been employed
- lighting condition of the area surrounding the monument
- at what distance the monument must be visible
- choice of the type and number of luminaires to be installed
- assessment of the lamp power of each device
- colour temperature of the lamps and luminous efficiency
- study and choice of colour representation by taking into consideration the psychological characteristics of colour

These general concepts, which seem to be essentially theoretical, become, on the contrary, fundamentally important on the practical level of the design of the lighting system of monuments or architectural structures.

The lighting of architectural structures must take into consideration the contrast between the luminance of the object of vision and the luminance of the background against which such object is profiled.

It is necessary to determine the desired architectural effect and to assess the impact of lighting through the correct calculation of luminances and the reflectivity of surfaces.

The right choice of light sources is fundamental because the colour of light must blend with the shades of colour that prevail on the surfaces to be illuminated. It is thus necessary to take into consideration a colour temperature of 4000-6000 K for concrete, marble and granite; 2000-3000 K for red brick and cotto coating.

The first of the two following tables contains the maximum lighting values (illuminance) suggested for various materials that can be employed for the surface of the monument to be illuminated. The second table contains the psychological definition of the use of colour.

Materials on the front side	Illuminance lux
Light-coloured stone, white marbl	60
cement, light-coloured marble	120
dark-coloured stone, grey granite	300
light yellow brick	100
red brick	300

dark-coloured brick	360
architectural concrete	200
dark-coloured tint	360
pastel tint	60

Psychological characteristics of colour

Color Psychological	efficiency
red warm luminous	exciting
orange warm lively	stimulating
green relaxing	very soothing
blue relaxing	soothing
violet sad	aggressive nervous
white freeing	overexciting

Luminaires that are commonly used in architecture are wide, medium and small light beams, with a width of light beam corresponding respectively to 60°, 30°, 15°. Wide light beams are used to illuminate surfaces that are located at a 20-metre distance, medium light beams are employed for distances between 20 and 40 metres, small light beams are used for distances exceeding these measures.

These devices must not be placed perpendicular to the surface to be illuminated, but in a way that makes all the angles of incidence on the front side different, they can be placed:

- on specially installed supports
- on the roofs or terraces of the buildings adjacent to the structure to be illuminated
- on the base of the structure

by paying, moreover, particular attention to their placement in order to avoid the danger of glare, light pollution and the light flux that might disturb various activities.

Until a few years ago, floodlights with cylindrical-parabolic reflectors were mainly used to illuminate from not a very big distance, and spherical-parabolic reflectors from big distances, moreover, the lamps that were generally used were sodium lamps with a monochromatic emission verging on orange. In the last few years there has been a turnabout in the conceptual application of this kind of devices and lamps. Manufacturers of intelligent floodlights have focused their research field and the technological applications of their products on architecture, thus being able to obtain excellent results and to launch on the market floodlights that are highly functional and that have a good light rendering, exceptional chromatic efficiency, a complete colour range using the well-tested CMY and the possibility of having a microchip inside the floodlight that can automatically set ignition and shutdown timing and the automatic change of colours.

The result obtained with these state-of-the-art floodlights in the field of architecture is that of achieving, in most cases, the correct lighting, highlighting, at the same time, particular elements that, because of their location would otherwise have been either not very well known or ignored.

Such devices allow a pictorial use of light to create immaterial works of art produced by handling light beams that thus become elements that can be manipulated and fictile.

In 1923 Le Corbusier said that architecture is the skilled game of volumes that are assembled under the light.

Lights and shadows reveal full, hollowed, emerging or deep forms, in their mutual and global assembling.

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