3.0 Lighting design

3.1 Lighting design concepts

The scientific application of artificial lighting is a relatively young discipline. In contrast to daylighting, which looks back on a tradition that developed gradually over several thousand years, the need to develop concepts for artificial lighting only became a requirement in the last century or two. Just 200 years ago planning using artificial light sources was confined to deciding where best to position the few candles or oil lamps available. Not really what might be referred to as adequate lighting design. Only in the last one hundred years, with the rapid development of efficient light sources, has lighting design acquired the tools that allow artificial lighting to be produced with adequate illuminance levels. This development is accompanied, however, by the task of defining the objectives and methods behind this new discipline, of deciding on the criteria by which the artificial light that is now available is to be applied.

3.1.1 Quantitative lighting design

The first and to date most effective concept has given rise to a set of standards or criteria for the lighting of workplaces. While decisions with regard to lighting in the private sector can be limited to the choice of suitably attractive luminaires, there is a clear interest in the field of the lighting of workplaces to develop effective and efficient forms of lighting. The main concern is which illuminance levels and types of lighting will ensure optimum visual performance, high productivity and safety at operating costs which are affordable.

Both aspects of this task were examined in detail, i.e. both the physiological question of the correlation of visual performance and lighting, and the technical question of establishing criteria by which the quality of a lighting installation can be measured. The concept of quantitative lighting design with illuminance as the central criterion, followed by uniformity, luminous colour, shadow quality and the degree of glare limitation, developed at a relatively early stage. Taking such criteria as a basis, standards were compiled containing minimum illuminance levels on the relevant working area for a wide variety of activities, plus the minimum requirements for the other quality criteria.

In practice, this would appear to require uniform, mostly horizontally oriented lighting over the entire space, which could best be effected by a regular arrangement of luminaires, e.g. continuous rows of fluorescent linear luminaires or louvred downlights. The illuminance level in each case is designed – in accordance with the demand for uniform lighting – to meet the requirements of the most complicated visual tasks that can be expected in the given space. The inevitable result is that

Type of lighting	Area of activity	Guideline E (lx)
General lighting in short-stay spaces	Circulation routes	50
	Staircases and short-stay spaces	100
	Rooms not continually in use – lobbies, public circulation	200
General lighting in working spaces	Office with daylight-oriented workplace	300
	Meeting and conference rooms	300
	Office space, data processing	500
	Open-plan office, technical drawings and design office	750
	Complicated visual tasks, precision assembly, colour testing	1000
Additional lighting for very complicated visual tasks		2000

Guide values for illuminance E for various areas of activity in accordance with CIE recommendations.