

4 LIGHTING DESIGN CONSIDERATIONS

This chapter, Lighting Design Considerations, and Chapter 5, Applications, discuss the methods and tools needed to produce integrated lighting applications that use advanced sources, luminaires, and controls. This chapter reviews the lighting design process, including issues of lighting quality as well as lighting levels (quantity), and presents a series of nineteen guidelines for designing advanced lighting systems. This chapter also reviews advanced tools and computer programs to assist designers. Chapter 5 provides examples of advanced lighting applications for private offices, open offices, executive offices, classrooms, several types of retail spaces, and an outdoor application. These examples demonstrate how advanced technologies can be integrated (with daylighting in some cases) to produce very efficient and quality applications.

4.1 The Lighting Design (and Redesign) Process

"Design" is the science and art of making things useful to humankind, and lighting design is the application of lighting—including daylight when it is specifically used as source of lighting—to human spaces. Like architecture, engineering and other design professions, lighting design relies on a combination of specific scientific principles, established standards and conventions, and a number of aesthetic, cultural and human factors applied in an artful manner.

In recent years, the field of lighting has been struggling with two prominent forces, *energy efficiency* and *lighting quality*. Just as the profession of lighting design began to emerge, in which the quality of lighting is held in high esteem, energy efficiency also became a concern in the design of buildings. Lighting designers initially faced the choice between attractive, well-lighted spaces and spaces that used a minimum of energy. The last quarter century has seen at least some resolution of this dilemma: dramatic improvements in lighting equipment technology, and maturation of the lighting design profession, each permitting better lighting designs that use less energy than previous practices.

The pursuit of more energy-efficient lighting dominated the lighting field from 1975–1990, creating awkward dilemmas for lighting designers. Fueled by utility rebates and commodity pricing, new lighting systems were designed to use minimum power. Existing lighting systems were "retrofitted" to save energy. Lighting installations of inferior quality were the rule, rather than the exception.

Many see the 1990s as a period in which the quality of lighting made a significant comeback. This was most evident as the new century approached in a new process for lighting design put forth by the Illuminating Engineering Society of North America (IESNA), the major technical association for lighting in North America. IESNA's recommended procedures for lighting design are described in section 3.3.4.

The *Advanced Lighting Guidelines'* mission is to describe lighting technology and techniques in order to encourage advanced designs that provide quality lighting with minimum environmental impact. While the IESNA procedure should generally lead to good quality lighting, it doesn't give energy efficiency and environmental impact a priority. The advanced strategies described in this chapter enhance the IESNA procedure so that it may be used to produce designs that minimize energy use and improve the sustainability of projects.

4.2 Lighting Quantity

4.2.1 Setting Criterion Illumination Levels

The IESNA design procedure described in section 3.3.4 is the most widely used and accepted method for determining lighting levels for applications. The method consists of the following:

- Choose an acceptable illuminance according to categories A through G, with A being the lowest and G being the highest. For instance, the illuminance associated with Category D is 30 footcandles.

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