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# IES Guide to Choosing Light Sources for General Lighting

## FOREWORD

DG-10 is a Design Guide depicting most of today's light sources employed in general and accent lighting luminaires. This updated edition includes more comprehensive technical & performance data on Solid State Lighting (SSL). Additional updates and enhancements for high and low pressure discharge lamp sources have been incorporated into this document, exemplifying their increasing diversity and technological advances while bringing into perspective important comparisons with SSL. For specific application of any light source one should consult the latest *IES Lighting Handbook, 10th Edition*, other applicable IES publications and manufacturer's lamp, ballast, driver and luminaire catalogs or web sites.

## 1.0 INTRODUCTION

This decade continues to be one of great change and innovation in many aspects of the lighting industry. Light sources have been primarily driving this change at a revolutionary pace. The rapid emergence of LED's will continue to exploit conventional lamp technologies, notwithstanding recent service life and performance improvements in some HID and Fluorescent lamps. The selection of all light sources along with ballasts, drivers and controls has never been greater. While definitive lists with absolute values for all lamp types and manufacturers go far beyond the scope of this guide, we have categorized them into expansive groups based on similar technologies. **Table 1** provides perspective on the key performance parameters of commonly used lamps as well as light emitting diodes (LEDs).

### 1.1 Variables Affecting Light Source/System Selection

The choice of light sources, luminaires, controls, and the system layout are closely interrelated. A method of selection easily applied to one type of light source may be impractical for another. Frequently, local environmental conditions such as vibration, ambient temperature, dust and dirt influence continuity of service, perceived color, lumen maintenance, glare, and economics. Once the type of lighting system best suited to the visual requirements of the area is chosen, the selection of light source and luminaire can be narrowed down to the overall compatibility of various sources. Beyond this point, the final choice becomes a matter of personal preference to the designer and the owner.

**Figure 1** shows typical shapes of commonly available lamps. Each lamp shape includes the corresponding American National Standards Institute (ANSI) designation that is also used by lamp manufacturers in their catalogs. The designation is typically followed by a number, which expresses the diameter of the lamp in eights of an inch so that T5 refers to a tubular fluorescent lamp with diameter 5/8 inches (1.6 cm) and PAR 30 is a parabolic reflector lamp with diameter 30/8 or 3.75 inches (9.5 cm). It should also be noted that a variety of bases are used in the manufacturing of lamps. More information is available in manufacturers' catalogs and the *IES Lighting Handbook, 10th Edition*.

If energy management is an issue, lighting controls may also become part of the total lighting system. Lighting control systems range from simple switches and photoelectric controls for turning an individual luminaire on and off to sophisticated microprocessor controllers that oversee all lighting in a multi-building complex. Switches, dimmers, timers, photocells, and other controls whether simple or complex, provide flexibility and contribute significantly to energy conservation. The use of controls can also contribute to occupant satisfaction and productivity. For additional information, refer to *IES Lighting Handbook, 10th Edition*.

Lighting systems are classified by the type of lighting produced, e.g., general, local, localized general, supplementary and task. Luminaires have been divided into 6 classifications based on light distribution characteristics, i.e., direct, semi-direct, general diffuse, direct-indirect, semi-indirect and indirect.

The lighting designer may also have a choice in the method of installation of the lighting system; or, architectural design and structural conditions may dictate a particular installation method. In any case, knowledge of the principles of light control and the lighting tools and devices that are available for such control will be helpful in the design of an efficient lighting system.

### 1.2 Natural Lighting

Whenever possible, the designer should consider the use of natural "daylight" lighting solutions. This is environmentally desirable, and may be necessary to achieve the low power densities that are being dictated by state and federal legislation. See **section 6** for a further discussion and refer to *IES RP-5 Recommended Practice for Daylighting* and *IES Lighting Handbook, 10th Edition*.