



# Technical Memorandum on the Use of Solid State Lighting in Sports Lighting Applications

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Use of Solid State Lighting in  
Sports Lighting Applications**

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## PREFACE

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This document is intended to be a supplement to the IES RP-6-15, *Recommended Practice for Sports and Recreational Area Lighting*.<sup>1</sup> RP-6-15 covers design and application information critical to sports lighting that is not contained in this document. This document should not be used as a replacement for RP-6-15. This document presents light sources that are relatively new to the lighting industry and are currently being used or considered for use in sports and recreational lighting applications. Where appropriate, the new sources will be compared and contrasted with traditional sources. This document is meant to focus on mainly recreational sports lighting, encompassing the same breadth of projects as noted in RP-6-15. The lighting requirements for professional sports and the related broadcasting issues are not addressed in this document.

It is intended that this information or an update of this information will be included in the next version of RP-6. However at this time it is felt that these new sources are significantly different from traditional sources that a separate document clarifying the differences and their impact should be issued.

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## 1.0 INTRODUCTION

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For many years, the most common source type for sports lighting has been high intensity discharge (HID) lamps. More specifically, metal halide lamps have been used due to their high efficacy (lumens per watt) provided in a small package.

Over the past decade, solid state lighting (SSL) technology has enjoyed a renaissance of discovery and evolution. Advances in the efficacy of the sources and the reduction in manufacturing costs have led to widespread use of these sources. Light-emitting diode (LED) is the most commonly used source of this type.

Initially, the relatively moderate efficacy (lumens per watt) of LEDs and their individual-chip size and shape meant that a large number would be needed to provide the same lumen package as a standard HID source. As a result, LED light sources were not an economically viable alternative to HID sources, given the higher illumination levels required for mainstream sports lighting projects. However, with the continued evolution of LEDs, and reductions in manufacturing costs, the LED source is now a viable alternative depending on the project's requirements (e.g., annual usage hours or budget).

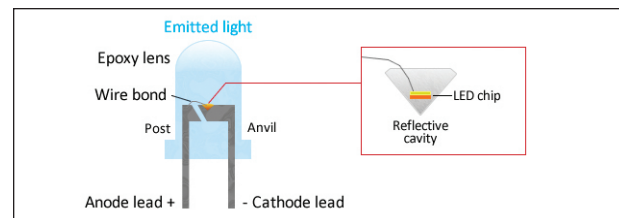
The LED light source offers a number of significant advantages, including energy efficiency, longer life, lower maintenance, and dimming capability. As their efficacy continues to increase, they are quickly becoming the dominant light source in artificial lighting. A disadvantage of the LED light source is that it has a greater luminance than the incandescent and HID sources used to-date for sports lighting. This increased luminance requires added considerations regarding the placement and aiming of LED luminaires to limit glare.

In addition to LED light sources, this document also includes a discussion of the characteristics of plasma technology. Although not as common as LED lighting, plasma lighting also offers improvements over traditional HID sources. While the plasma source is not a solid-state source, the use of solid-state drivers and the electrodeless design present a novel approach that is new to the field of sports lighting. Thus, it has been included in this document to compare and contrast new source technologies against the traditional use of HID. (Refer to **Annex A – Plasma Lighting**.)

As the use of solid state technologies grows, manufacturers and lighting designers need to understand the characteristics of these sources in order to properly design and apply them in sports lighting. This document is meant to outline some of these characteristics and to expose the reader to the issues involved in applying solid state lighting to sports lighting applications.

### 1.1 Light Emitting Diodes (LEDs)

The light emitting diode is a solid-state semiconductor that converts electrical energy to visible light (photons) and heat. The photons are emitted in a narrow spectrum around the energy band gap of the semiconductor material. **Figure 1** shows the key components to the diode.



**Figure 1. Light emitting diode (LED)**

LEDs emit nearly monochromatic light based on the material characteristics of the semiconductor. Thus, the diodes can be characterized as red, green, or blue LEDs. To produce white light for general lighting, three common methods are used: red, green and blue (RGB) LEDs are 'mixed,' phosphors are used to