

**IESNA Approved Guide
for
Identifying Operating
Factors Influencing
Measured Vs.
Predicted Performance
for
Installed Outdoor
High Intensity
Discharge (HID)
Luminaires**

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The
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IESNA Approved Guide for Identifying Operating Factors Influencing Measured Vs. Predicted Performance for Installed Outdoor High Intensity Discharge (HID) Luminaires

Publication of this Committee
Report has been approved
by the IESNA. Suggestions for
revisions should be directed
to the IESNA.

Prepared by:
**The Subcommittee on Photometry of Outdoor Luminaires
of the IESNA Testing Procedures Committee**

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IESNA Approved Guide for Identifying Operating Factors Influencing Measured Vs. Predicted Performance for Installed Outdoor High Intensity Discharge (HID) Luminaires

FOREWORD

This guide outlines factors that can cause differences between calculated and measured illuminance and luminance values of outdoor High Intensity Discharge (HID) lamps and luminaires. It does not offer solutions, nor does it quantify all of the possible variables that might be encountered. *The IESNA Lighting Handbook*¹ should be consulted for specific design recommendations.

1.0 INTRODUCTION

While lighting manufacturers and independent testing laboratories generally follow IESNA published procedures for testing HID luminaires under controlled laboratory conditions, measurements made in the field to confirm predicted performance can be influenced by a variety of factors. Under laboratory conditions, measurements are made exercising care in the precision and accuracy of the photometric measurement conditions including luminaire orientation, test distances, ambient temperature, electrical supply and regulation, and lamps selected for optimal stability and arc tube geometry. In the field, this level of control and accuracy in operating and measurement conditions is seldom possible and measurements made in the field of installed photometric performance can deviate from predicted performance levels. This guide identifies many of the potential factors that apply to outdoor HID luminaires including mercury (Hg), metal halide (MH), high pressure sodium (HPS), and low pressure sodium (LPS) lighting equipment utilizing core and coil ballasts for contemporary lamp wattage designations. The issues and factors associated with electronic ballasts for HID lamps have not been addressed in this revision of LM-61 as the technology remains in significant flux and outdoor use of electronic ballasts is not yet prevalent on a large scale.

2.0 VARIABLES

This guide lists variables that can affect the results of an HID lighting design and outlines issues encountered when comparing field measurements with pre-

dicted calculations using photometric data. It is possible that the tolerances for all the components could combine to produce a substantial difference in illuminance or luminance performance between laboratory and field conditions. The variables can be divided into five general categories:

- * Power Supply and Ballast Variations
- * Lamp Variations
- * Luminaire Optical Variations
- * Field Conditions
- * Field Measurement

Each category is reviewed and its significance with respect to HID luminaire operation is explained.

2.1 Power Supply and Ballast Variations

SAFETY CAUTION: Only persons experienced in using measurement equipment under high voltage conditions should make measurements of electrical characteristics at the lamp. High primary and secondary voltages, high-voltage starting pulses for both HPS and MH lamps (up to 5000 V), and high-voltage instant re-strike circuits (over 40kV) present a serious shock hazard. Proper precautions must also be taken to protect instruments from the high voltages and high voltage starting pulses.

2.1.1 Power Supply Voltage - In the photometric laboratory, it is standard practice to maintain lamp watts at a constant value when HID lamps, or luminaires using them, are being photometered. This is typically accomplished by monitoring lamp power via a wattmeter and adjusting the supply voltage to the ballast until the lamp is stable at rated lamp watts. This establishes the luminaire performance and efficiency for the photometric report with a standardized procedure.

The predicted light output in the field assumes that a 'nominal' electrical supply is used. In field installations, lamps may or may not operate at their rated wattage even though the ballasts are operated within the design limits of the electrical distribution system. The supply voltage at a luminaire is dependent on several electrical power system characteristics. Factors such as local time variable power loads, transformer tap choices, and the length and gauge of the wiring runs can all influence the supply voltage at a luminaire. Even under ideal conditions, power system voltage regulation is limited to 5 percent. Ballasts have a limited capability to regulate power to the lamp and actual lamp wattage is influenced by the fixture's supply voltage where installed. There are several basic ballast types each providing differing regulation capabilities and differing sensitivities to supply voltage variations.