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IESNA Guide *for* Directional Positioning *of* Photometric Data



Prepared by The Angular Positioning Sub-Committee of the
IESNA Computer Committee

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

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Sub-Committee
of the IESNA
Computer Committee**

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INTRODUCTION

This document provides a clearly defined set of terms that can be used to designate the directional positioning of photometric data. The terms should be used by both providers and users of photometric data and lighting software to unambiguously and consistently specify how photometric data is to be "rotated" before it is used.

Two similar but fundamentally irreconcilable angular positioning systems have existed for years. The Clockwise from North (CN) system starts by rotating luminaire photometrics clockwise from north. The Counter-Clockwise from East (CCE) system starts by rotating luminaire photometrics counter-clockwise from east. A third positioning method called "aiming a luminaire at a point" has also existed for years and will also be discussed.

Many early and current lighting programs use *north* as the starting point for luminaire orientation, with angles measured clockwise as on a compass. Specifiers who expected pole top installers to use compasses would often provide magnetic bearings as well. Users (designers, engineers, and steeplejacks) accustomed to these techniques would choose the CN system.

Many computer aided design (CAD) programs and many related lighting programs use *east* as the starting point for orientation, with angles measured counter-clockwise. Users (designers, engineers, draftsmen, physicists, and mathematicians) accustomed to these methods would select the CCE system.

Designers of floodlighting, security, and sports lighting often use the notion of "aiming a luminaire at a point," so most computer programs that handle floodlighting and sports lighting employ the "aiming at a point" concept. For floodlighting and sports lighting work, aiming at a point is often the most convenient approach to choose.

Note that this document assigns specific, standard meanings to certain words, thus some users may need to adjust their vocabulary. Most should find a positioning system compatible with their normal patterns/experience. This document does not show a preference for any system, but rather describes each of the three systems and then explains how to convert between them.

In applying CN or CCE, four types of angular "rotation" are defined (*Orientation, Tilt, Roll, and Spin*) and each shall be performed in the defined order. Any (or all) of the rotation angles may be zero. Each subsequent rotation is applied to the axis system as previously rotated (the local axes), not the original axis system (the global axes).

Orientation, Tilt, Roll, and Spin can be described using x, y, and z axes, but their implementation in the CN system and CCE system must be described separately, and separate drawings of each coordinate system are needed.

1.0 PHOTOMETRY SYSTEMS

Most photometry is available in a standard format in North America.¹ Two types of photometry, which differ in the orientation of the photometric web, have traditionally been used with that standard. Type C photometry^{2,3} is commonly used for indoor and roadway luminaires. Type B photometry^{4,5} has been used for adjustable floodlights. Refer to **Annex B** for a description of Type B and Type C photometry.

Note: The figures discussed in **Section 2.0** will assist in understanding the positioning systems described in **Section 1.1** and **Section 1.2** which immediately follow.

1.1 Clockwise from North (CN) Positioning System

The Clockwise from North (CN) angular positioning system is applicable to both Type B photometry and Type C photometry. With this system the initial position of photometric zero (horizontal angle = 0° , vertical angle = 0°) is straight down in the direction of the -z axis. To set the initial position of the luminaire photometric grid in three-dimensional space, a second photometric direction must be established. The photometric direction (0° , 90°), where the horizontal angle = 0° and the vertical angle = 90° , is convenient for both Type B and Type C photometry. Initial photometric direction (0° , 90°) for the CN system is placed in the direction of the +y axis (north).

First, *Orientation* is applied about the z axis, clockwise looking in the direction of the -z axis. Positive angles move the +y axis toward the +x axis. Orientation = 0° places the +y axis toward north. (Note: Initially, before any rotation is applied, the local and global coordinate systems are aligned).