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Illuminating
ENGINEERING SOCIETY

RECOMMENDED PRACTICE:
HORTICULTURAL LIGHTING

AN AMERICAN NATIONAL STANDARD

Approved American National Standard
ANSI

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Prepared by the Horticultural Lighting Committee.

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1.1 Introduction

The difference between architectural and horticultural lighting design is simple: architectural lighting is for people, while horticultural lighting is for plants. People rely on light to perceive their world, while plants rely on light to perform photosynthesis.

The reality is more nuanced, however. We know that in addition to perceiving visible light, we have intrinsically photosensitive retinal ganglion cells (ipRGCs) in our retinas that respond to the quantity and color of light by entraining our circadian rhythms, as well as influencing other neurological and neurobehavioral functions.[1] This is a topic of ongoing research that is changing architectural lighting design practices.

It should come as no surprise, then, that plants rely on light for more than just photosynthesis. Horticulturalists casually speak of micromoles, quantum sensors, photomorphogenesis, secondary metabolites, and more. For lighting professionals more familiar with lumens, illuminance meters, and equivalent melanopic lux, it can be very confusing.

This Recommended Practice is written primarily for lighting professionals who are interested in horticultural lighting for greenhouses, indoor farms, and building atria. While farmers and horticulturalists may know the lighting needs of specific plants, the role of the lighting designer is to translate these needs into workable and affordable lighting systems.

At the same time, there are opportunities for lighting professionals to understand how and why plants respond to visible light and ultraviolet radiation. Numerous academic papers published in many different journals have been written on this topic, ranging from practical experiments with LED lighting to molecular biology. Despite this, the basic principles presented herein are straightforward and easy to understand.

The practice of horticultural lighting design will continue to evolve as academic research proceeds and farmers refine their understanding through controlled experiments, trial-and-error field work, and shared knowledge. Behind it all, however, is the need for lighting professionals to *speak the language* of horticultural lighting and apply their lighting system design knowledge and expertise.

1.2 Scope

While humans and plants use light in different ways and for different reasons, the fundamental job of the lighting professional for these applications stays the same—deliver the right amount of light with appropriate spectral power distribution to the target at the right time. The amount of light is characterized differently for plant versus human applications. For plants, the amount of irradiation, the timing of delivery, and the total light dose over the course of a day and throughout the plant life cycle need to be considered. The appropriate spectral power distribution is different for plants and humans—and can vary between plant species (and even between different cultivars within a species). This document describes these differences between architectural and horticultural lighting design, so that lighting professionals will have the necessary information to translate their architectural lighting know-how into horticultural lighting practice.

2.0 Normative References

2.1 ANSI/ASABE S640 JUL2017

American Society of Agricultural and Biological Engineers. Quantities and Units of Electromagnetic Radiation for Plants (Photosynthetic Organisms). St. Joseph, MI: ASABE; 2017.

2.2 ANSI/ASABE S642 SEP2018

American Society of Agricultural and Biological Engineers. Recommended Methods for Measurement and Testing of LED Products for Plant Growth and Development. St. Joseph, MI: ASABE; 2018.

2.3 ANSI/CAN/UL 8800:2019

UL, LLC. Standard for Horticultural Lighting Equipment and Systems. Northbrook, IL: UL, LLC; 2019.